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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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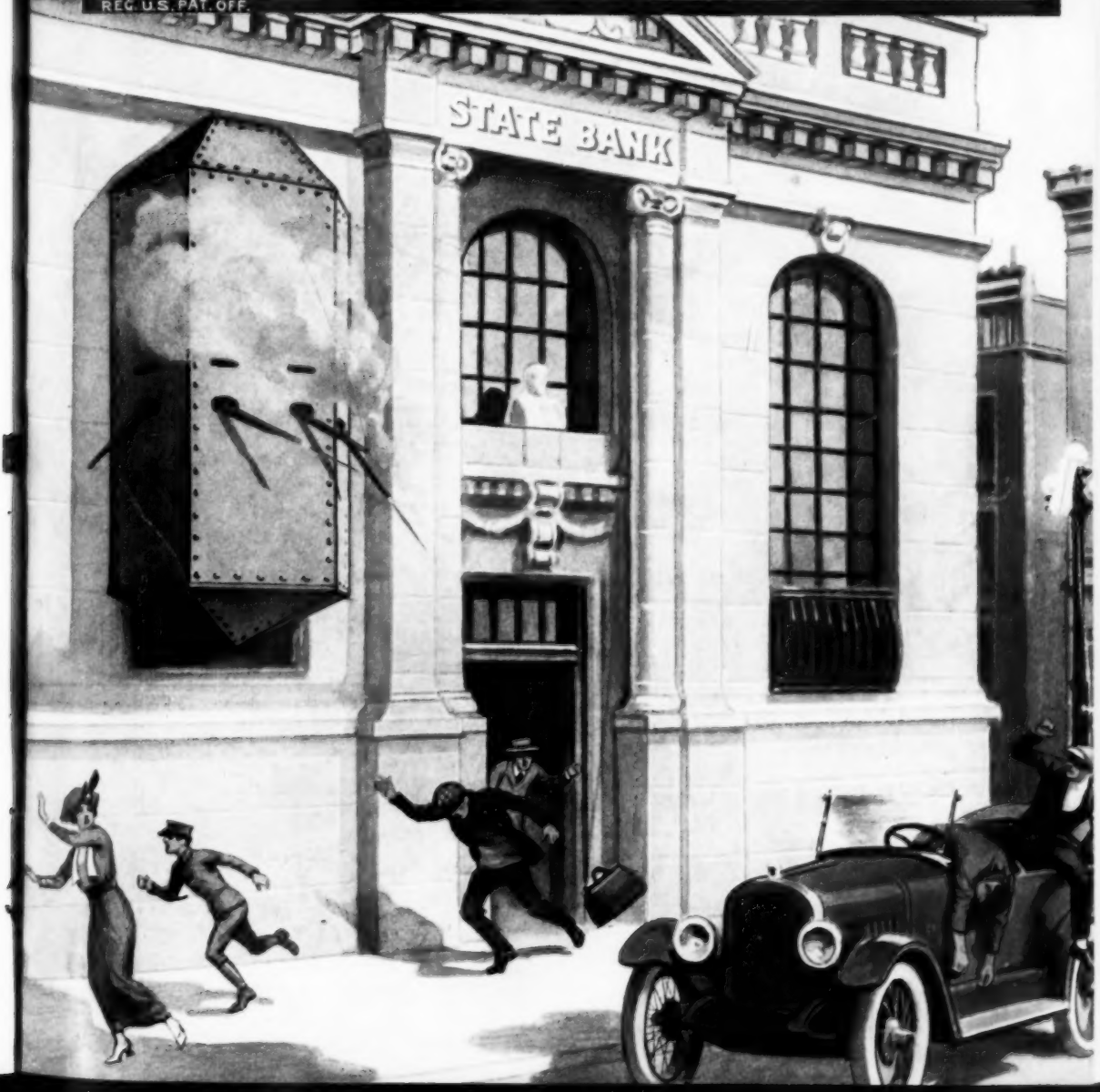

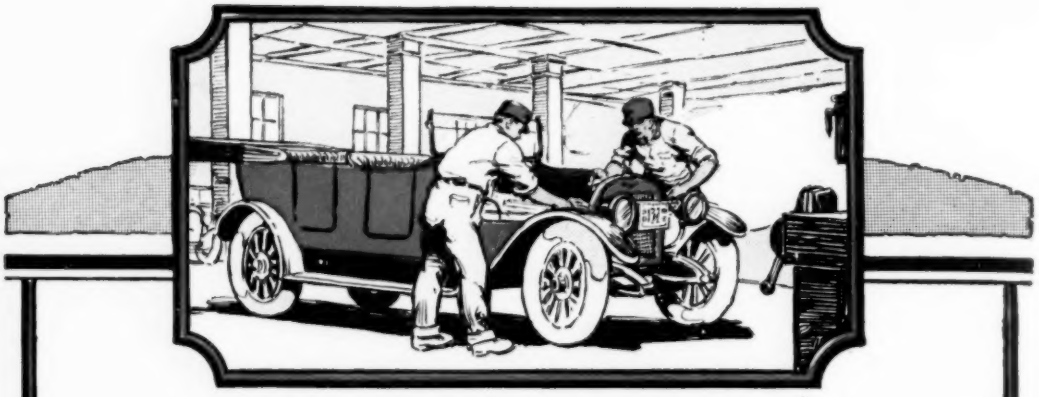

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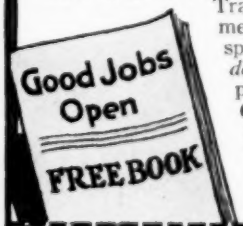

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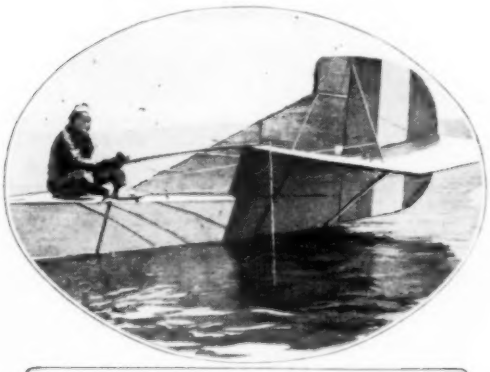
Vol. 32 OCTOBER, 1919 No. 4

Deep-Sea Fishing Simplified by Seaplane

SPORTSMEN of both coasts now have tried the seaplane as a fishing boat, and found it good. The two New York fishermen who made the first trip the other day started late, but they were first on the grounds. They passed the plodding motorboats—considered, until now, remarkably swift—midway, and were among the schools of bluefish before their astonished brother anglers came within hailing distance.

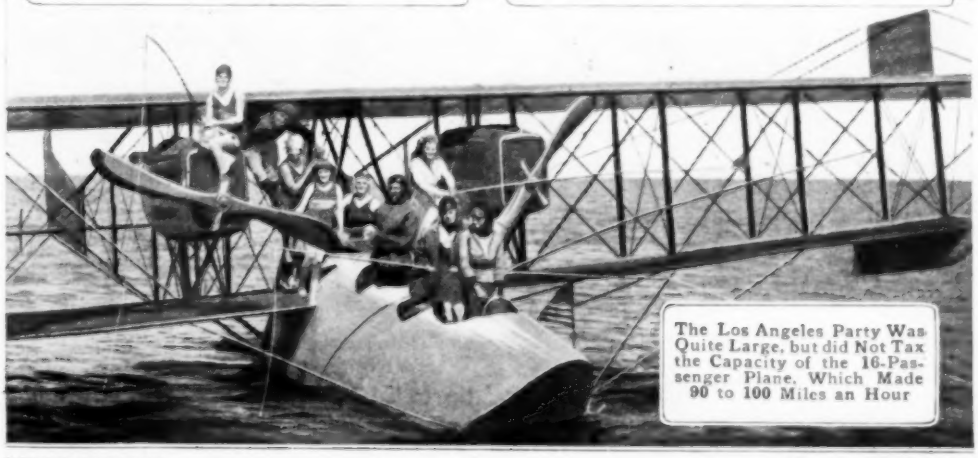
However, the speed alone was not the thing that established the plane as a fishing craft par excellence, but its ability actually to locate the fish schools for the impatient anglers, by giving them the vision of great altitude. With such guidance, using their rods from hull and wings, they made a remarkable catch in a very short time.

A party of Los Angeles fishermen found the seaplane most valuable for the



Fishing from the Hull of the Seaplane, the Angler may Forget His Wings, and Think of His Craft Merely as a First-Class Fishing Boat

If the Fisherman Desires to Change His Position or Find a Breezier Seat, the Wings of the Resting Plane Are Always Available



The Los Angeles Party Was Quite Large, but did Not Tax the Capacity of the 16-Passenger Plane, Which Made 90 to 100 Miles an Hour

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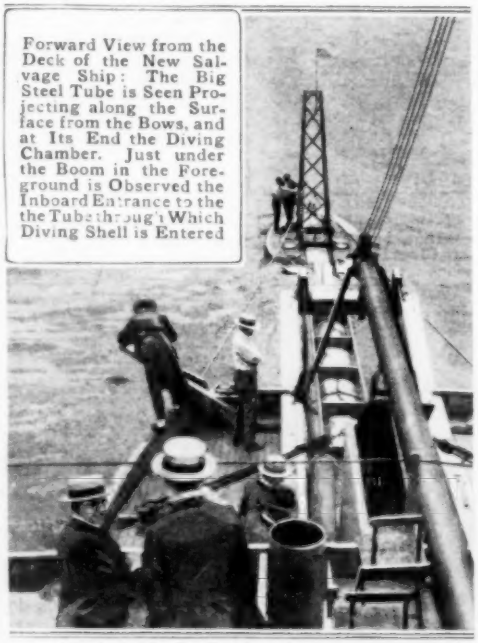
It Is Apparent That the Seaplane Fishing Party "Brought Home the Bacon," and Equally Plain, from One or Two of the Costumes, That Angling Was Not the Only Aquatic Sport Indulged in the Calm Waters of the Kelp Beds, After a 50-Mile Flight in a Half Hour

mileage it so rapidly consumed; for distances are long on the Pacific. To the kelp beds of Santa Barbara is 50 miles. They made it easily and quickly, passing smoothly above unpleasantly rough seas and landing on the calm waters of the weed bars, from whose well-stocked but unfrequented pockets they took as many fish as they cared to burden the plane with on the homeward trip.

A wonderful vista of brand-new sport opens with this application of the seaplane, because inaccessible places are quickly reached.

SALVAGING SUBMARINE EXPLORES OCEAN BED

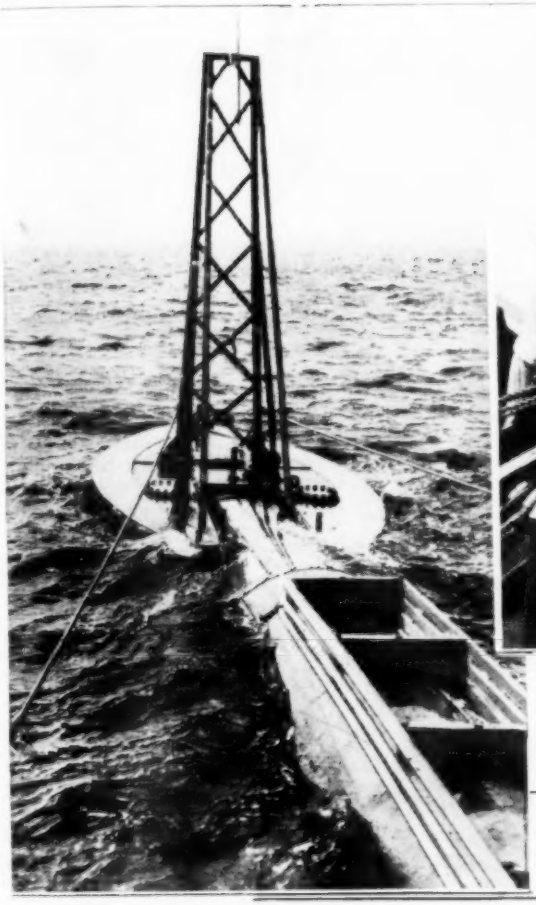
The queerest submarine boat of all has just made its appearance in the waters of Long Island Sound. Its purpose is peaceful, but none the less extraordinary; for it is to be used to explore the bottom of the sea, and to salvage what it may of the 22,000,000 tons of material that went down in the war. Its most remarkable feature is that its occupants may open a door in its bottom and walk, almost dry-shod, on the ocean floor. The inventor of the strange craft is Simon Lake, celebrated builder of American submarines. The new boat, however, is only sub in part, for the greater portion of it, looking like a big twin-hull dredge ship, stays afloat and provides for the safety and comfort of those incased in the diving shell on the ocean bed.



Forward View from the Deck of the New Salvage Ship: The Big Steel Tube is Seen Projecting along the Surface from the Bows, and at Its End the Diving Chamber. Just under the Boom in the Foreground is Observed the Inboard Entrance to the the Tube through Which Diving Shell is Entered

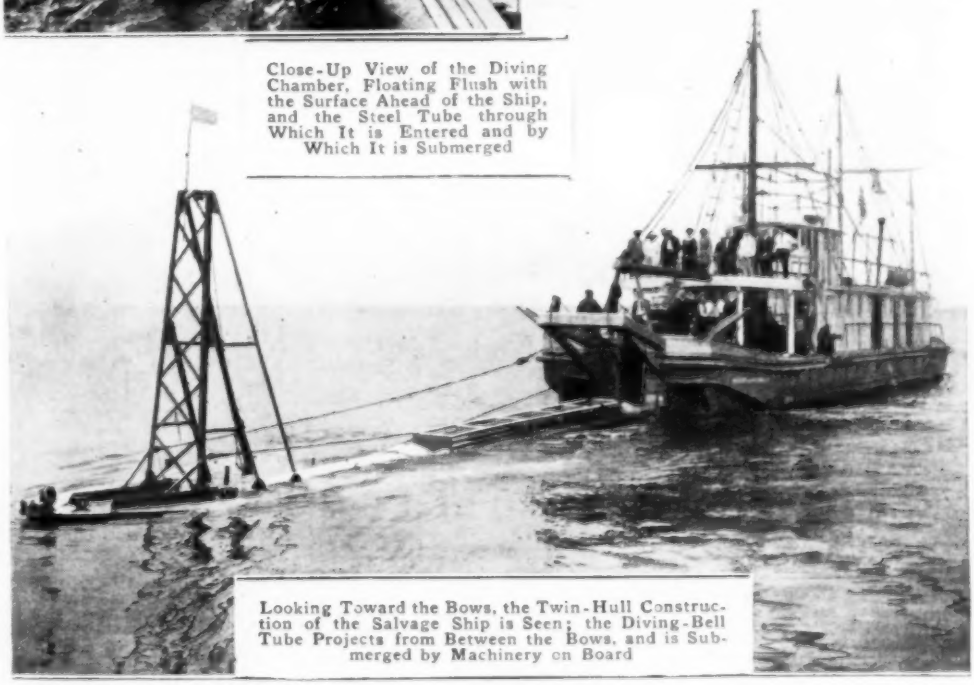
The peculiar mechanism of the vessel comprises a long steel tube extending forward from between the bows, at the end of which is a steel chamber. When the exploring crew has entered the chamber by way of the tube, whose diameter is 4½ ft., the latter is simply turned downward on its inboard pivots until the chamber rests upon the bottom. Air under pressure is constantly pumped in to exclude the water. On the bed of the sea, the bottom door may be opened, giving direct access to the ocean floor and whatever may rest upon it.

The first model has a diving chamber 8 ft. long by 7 ft. high, and has operated in water up to 54 ft. deep. But plans are under way for a larger ship with a 300-ft. tube; and its first assignment will be the an-



Steel Trap Which Constitutes the Inboard Entrance to the Tube and Diving Chamber: Emerging from It Are Captain Lake (on the Right) and a Guest of the Trial Trip, the Latter with a Horseshoe Crab Picked from the Sea Bottom

Close-Up View of the Diving Chamber, Floating Flush with the Surface Ahead of the Ship, and the Steel Tube through Which It is Entered and by Which It is Submerged



Looking Toward the Bows, the Twin-Hull Construction of the Salvage Ship is Seen; the Diving-Bell Tube Projects from Between the Bows, and is Submerged by Machinery on Board

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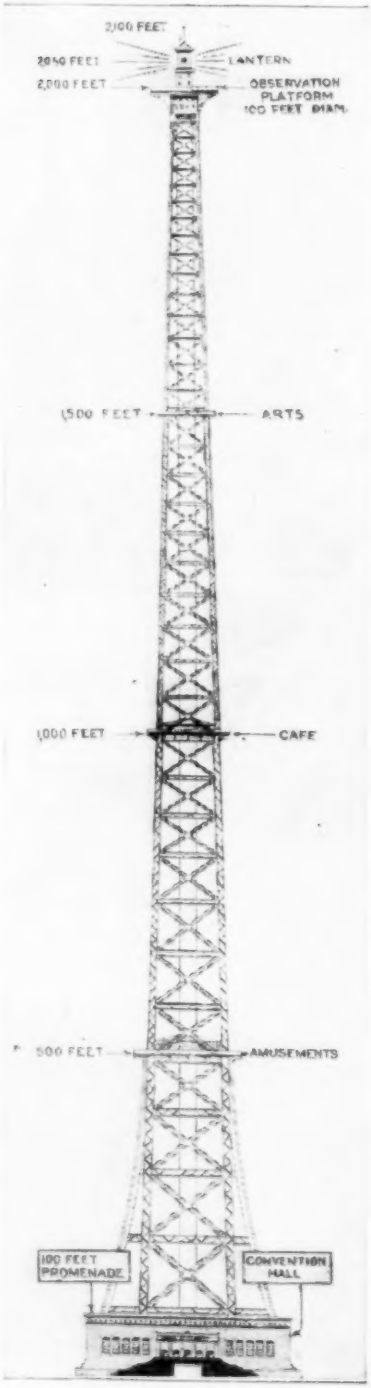
cient wreck of the "Hussar," which, with a cargo of $5,000,000 in gold, has lain at the bottom of Hell Gate since the Revolutionary War.

PLAN WORLD'S HIGHEST TOWER FOR MEMORIAL

A monumental tower of steel, more than twice as high as the world's loftiest present structure, the Eiffel tower, is proposed by leading citizens of Pittsburgh for a memorial to the soldiers of that district. The total height of the tower as planned is 2,100 ft., with an observation platform 100 ft. in diameter at the 2,000-ft. level, surmounted by four powerful lanterns, indicating, by their colors, the points of the compass to all aerial navigators within a 40-mile radius. At the 1,500-ft., 1,000-ft., and 500-ft. levels respectively are a trophy hall, a restaurant, and an amusement hall. At the base a monolithic structure, 100 ft. high and 300 ft. square, contains free assembly rooms on the ground floor, and a vast convention hall 35 ft. above, seating 15,000. The concrete foundation goes down 60 ft. to bedrock, and in it are imbedded the base columns of the tower. The structure, estimated to cost $3,000,000 and to require 9,000 to 10,000 tons of steel, is designed to use only the standard shapes regularly produced in the "Steel City."

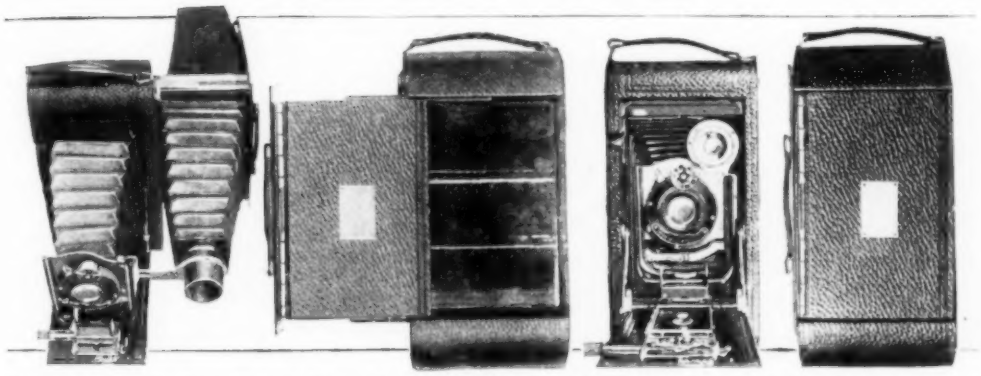


Pittsburgh's Proposed Memorial, the Tallest Tower in the World, Is a 2,100-Foot Structure of Standard Steel Shapes and will Cost About $3,000,000

AUTOS OF FUTURE VERY LIGHT, ENGINEERS SAY

Lighter cars, higher mileage, and fewer cylinders are the predictions of auto engineers, both in this country and in England, for the motor vehicles of the future. A particularly interesting American prophecy specifies a five-passenger car weighing only 900 lb., with a plywood body, a new type of spring suspension, a 120-lb., 15-hp., six-cylinder motor, and a mileage of 30 to 40 per gallon. The design of such a car will be influenced largely by the discoveries and adopted practices in airplane construction, and the result will be an easier-riding vehicle than the present cars, in spite of its extreme lightness. Large cars will be limited to six cylinders, while four will be considered enough for a roadster, and closed bodies will take preferred position. An apparently inevitable development is the design of future motors for the consumption of low-grade fuels. Considerable progress already has been made in this direction, and cars have gradually been growing lighter and more speedy for the last four or five years.

An airplane is to be used by a rice grower near Sacramento, Calif., to drive wild ducks out of his fields. Other farmers in that locality may adopt this method of protecting their crops from the birds.



From the Left, the First Picture Shows the Camera with Focusing Attachment Ready for Use; the Second Is a Rear View, Indicating the Way in Which the Back of the Case is Drawn Out; the Third, Front View, Shows the Auxiliary Lens Folded in the Upper Right Corner; the Fourth, Camera Folded

FOCUS WITH FULL-SIZE IMAGE IN NEW HAND CAMERA

Lack of any means for visual focusing is probably the greatest fault of the popular folding snapshot camera. A camera arranged to supply the deficiency is now on the market, however, and gives a full-size image on ground glass while the exposure is being made. The focusing equipment consists of an auxiliary bellows which is inclosed, with the ground glass, in a sliding box attached to the camera; and an extra lens which folds in alongside the front board. For use, the box is drawn out sidewise, bringing the bellows with it. The latter is then extended and joined to the lens. The two lenses focus together, so that a sharp picture is assured, covering exactly the field the operator desires.

INTERNATIONAL FUND DESIRED TO RESTORE RHEIMS CATHEDRAL

The nations allied against Germany during the war, who watched with horror the slow destruction of the Rheims cathedral, will be gratified to learn of an opportunity, now presented, for participation in its restoration as a memorial to the heroic dead. Subscriptions will be received by influential committees now forming in all the allied and neutral countries. Supporters of the scheme have found that destruction has gone so far that at least $5,000,000 will be needed for the work; yet they are enheartened by the fact that the original plans have been preserved and may be copied exactly. Much of the fallen stonework, too, can be recut and used again. The project has the approval of the French government.

PAGING BY DOTS AND DASHES IS NEW OFFICE SYSTEM

A common telegraph key, fixed near the telephone that handles incoming calls, has proven highly effective as a means of paging individual workers in a big government office on the west coast. When a particular person is wanted on the telephone, or called for by a visitor, and his immediate location is unknown, the operator sends out a dot-and-dash code call which is made audible throughout the building by properly distributed sounders. Each sounder has its own key,

Some Member of the Office Force, Whereabouts Unknown, is Wanted at the Telephone, and the Operator is Sounding His Dot-and-Dash Code Call on the Telegraph Key at Her Right Hand

and the call is acknowledged by its recipient before he goes to the main office. No knowledge of telegraphy is required, of course, as each worker uses only his own code.

¶Improvements planned for the port of New York will cost over $28,000,000. Several new piers are projected, and extensive dredging is contemplated.

HUNTING WILD HORSES IN UTAH

By FREDERICK KINNEY

AMERICANS who like adventure and excitement in a hunt are advised to try their hand at hunting wild horses. That they will find this sport quite as thrilling as cornering a tiger, is the opinion of a sportsman who has just returned from a month's hunt in Skull Valley, near the Utah-Nevada line.

There are thousands of wild horses in this valley, and ranch owners in that district have begun a war of extermination. The wild steeds are becoming very troublesome, leading away domesticated stock, and demolishing fences and damaging property in general. Before the plan of shooting these horses was adopted, the ranchers tried corralling and shipping them to eastern markets. The expense of catching and shipping the animals was far above possible profits, however, and the danger connected with attempts at capture also were disproportionate. The horses are decidedly vicious, and several cases are cited where they literally dashed their brains out against a tree, or post, rather than submit to capture.

The expedition here referred to included several members, and during the month of wild-horse stalking the party shot 102 animals. The largest day's shooting was ten head. This number was made possible only by the fact that the leaders of two bands of wild horses met at a water hole and immediately began a battle for supremacy.

A fight of this kind is always to the death, and the most exciting period of the hunt was spent in watching the two wild beasts biting, tearing, and kicking, while members of the two bands intermingled and looked on, taking care to keep away from the flying hoofs. It was while the mares were closely banded in this manner that the party shot their record "catch" of ten horses. The noise of the guns soon startled the scores of animals, and they bolted in all directions for the foothills. One of the leaders was left behind, with a broken leg. He was dispatched by one of the hunters. The animals shot by the party were skinned, the hides bringing from seven to eight dollars each in the Salt Lake market.

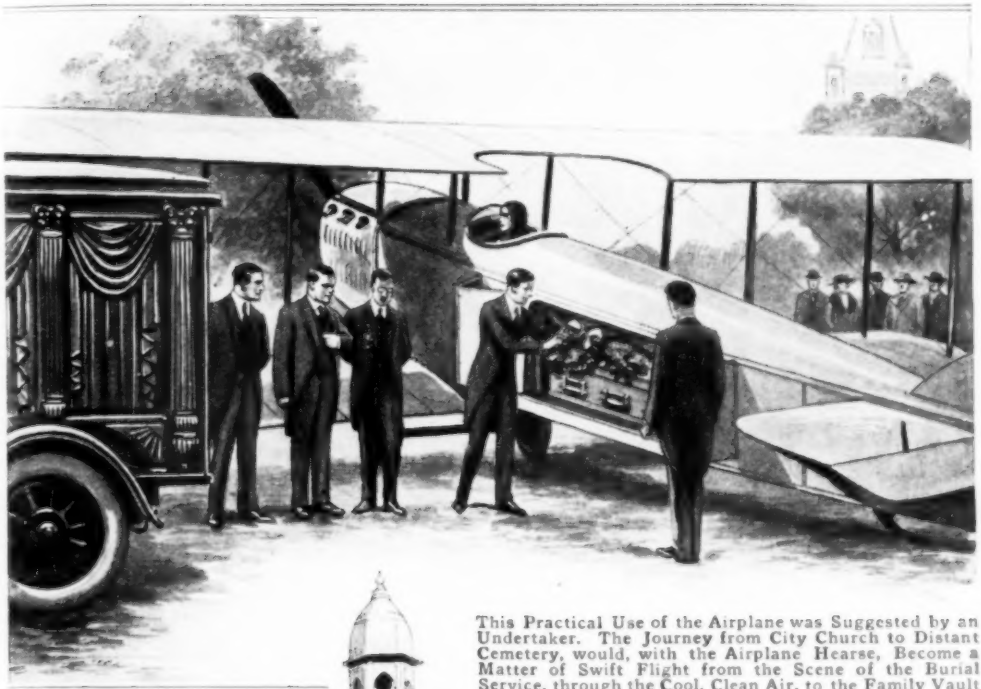
Ranchers in Skull Valley invite shooting parties to go after the wild horses, and furnish guides and other necessary supplies. Estimates of the number of wild horses in the valley run as high as fifteen thousand.

PUMP FERTILIZING MATERIAL FROM MICHIGAN LAKES

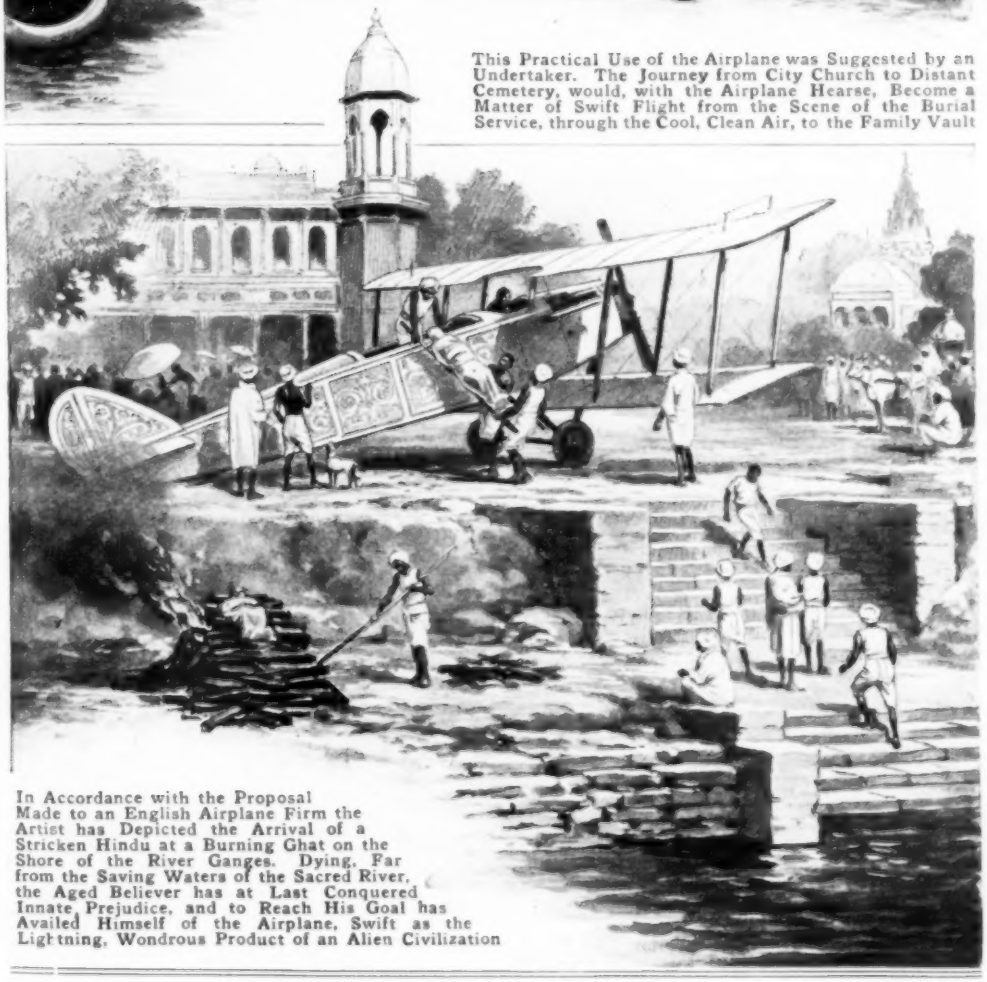
Valuable fertilizing material can be obtained from the bottom of many of the numerous small lakes in Michigan in the form of marl, a clay containing a high percentage of lime, according to agricultural authorities. Experiments conducted recently, to determine an inexpensive method for removing the deposits, indicated that the substance can be raised economically by a pump of the type used for lifting sand. Where the deposits are loose, the suction of the pump is strong enough to separate it from the bottoms. Dynamite has been found suitable for breaking up more solid deposits. The value of marl as a fertilizer has been known for a considerable time, but the Michigan supply was discovered recently.

AERIAL TRANSPORT FOR THE DEAD AND THE DYING

Among suggestions lately considered by a great English airplane firm are two which have the merit of extraordinary novelty. The first comes from an undertaker who believes that an airplane hearse should be used when a person dies far from his home or desired place of burial. He believes that such a journey to the grave need not be a bit of sensation mongering, but might actually come to be valued as a striking symbol of man's final destiny. The second suggestion, strange as it may sound to the uncomprehending occidental mind, may yet yield a fortune to some enterprising company. For devout Hindus from all corners of India travel by the hundreds of thousands each year to the sacred Ganges, there to wash away their sins or die in peace on the river banks. Though many are rich, as seen in the holy city of Benares where their lavish charity supports whole tribes of mendicants, many die short of their goal. So the suggestion is made that an aerial service be instituted to rush the sick, and particularly the dying, to the holy stream, that they may die assured of salvation and future bliss.



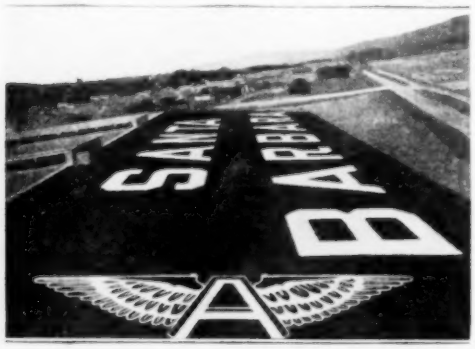
This Practical Use of the Airplane was Suggested by an Undertaker. The Journey from City Church to Distant Cemetery, would, with the Airplane Hearse, Become a Matter of Swift Flight from the Scene of the Burial Service, through the Cool, Clean Air, to the Family Vault



In Accordance with the Proposal Made to an English Airplane Firm the Artist has Depicted the Arrival of a Stricken Hindu at a Burning Ghat on the Shore of the River Ganges. Dying, Far from the Saving Waters of the Sacred River, the Aged Believer has at Last Conquered Innate Prejudice, and to Reach His Goal has Availed Himself of the Airplane, Swift as the Lightning, Wondrous Product of an Alien Civilization

STATION SIGN FOR FLIERS ON ROOF OF STUDIO

Anticipating the day when aerial traffic will require station signs, the citizens of Santa Barbara, Calif., have labeled the



Aerial-Station Sign at Santa Barbara, California: This Picture was Taken from a High Platform Built Especially for the Purpose

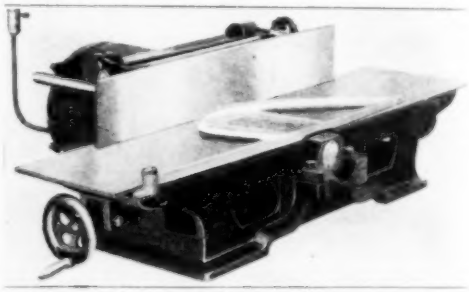
city appropriately. On the flat roof of a long building, used as a studio by a motion-picture film company, is painted the name of the municipality in letters 18 ft. high and 12 ft. wide. White paint was used for the letters, while the background is black. Airmen two and one-half miles in the air have been able to read the sign, it is declared.

EXPERTS TRAINED BY ARMY AID TRACTOR INDUSTRY

Tractor development has been somewhat hampered in the past by the lack of competent drivers and mechanics, but a new era for the industry has begun with the release from military service of thousands of thoroughly trained experts in these fields. A large percentage of the men who obtained their knowledge in army schools are expected to take some part in the tractor business, either as salesmen, dealers, service men, or farm-work contractors. Many branches of the army taught soldiers how to drive and repair tractors. Besides the motor-transport corps schools that were established not long before the armistice was signed, there were classes in driving and repair work for men in the field artillery, the tank corps, and the quartermaster corps, from the time mobilization began. One of the largest schools was at Camp Jackson, S. C., where field-artillery men were instructed.

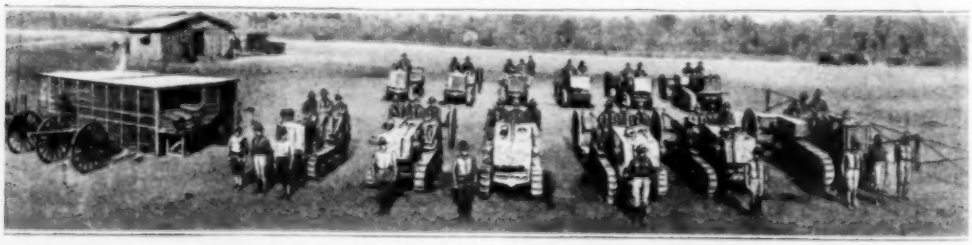
PORTABLE PLANING MACHINE ELECTRICALLY OPERATED

Current from an ordinary electric-lighting circuit will operate a portable jointer, or planing machine, intended for bench use, which has made its appearance on the market. Boards, 6 in. wide, can be handled by the device, though it is so light that one man can carry it easily. The motor is an integral part of the machine, and turns the cutting heads on an extension of its shaft. Interchangeable cutters are used. It is possible to adjust the two-part table of the jointer to vary the distance of its surface from the cut-

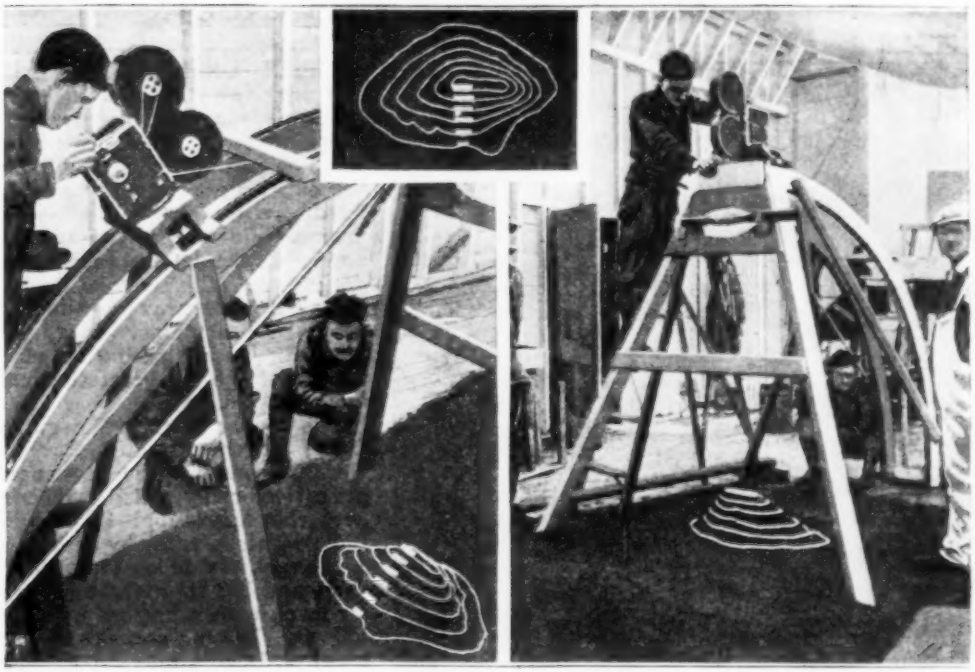


Portable Planing Machine for Bench Use: It Runs on an Ordinary Electric-Lighting Circuit, and can be Adjusted to Meet Many Requirements

ter, or to regulate the size of the throat over the cutting tool. The fence, which can be set for beveling the edges of boards or for material of different width, is fastened to the motor casing by sliding rods.



A Few of the Thousands of Men Trained by the Army to Drive and Repair Tractors, with Their Machines: The Picture was Taken at Camp Jackson, South Carolina, Where Field-Artillery Men were Given Instruction



Map-Reading Instruction Facilitated by Moving Pictures of Model Mountain: The Camera is Seen at the Left Halfway up Its 90-Degree Arc; at the Right It Is at the Top, with the Miniature "Mountain" on the Floor Beneath, Its Contour Lines Marked with White Worsted. The Insert Shows the Plan of the Model Mountain

TOPOGRAPHICAL-MAP STUDY WITH MOTION PICTURES

The U. S. general staff, in 1918, decided to utilize the screen as a means of intensive instruction. Maps had to be used and understood in order to break the Boche. Contour lines, which meant little to the average soldier, were explained graphically in a reel devoted to map reading.

A miniature mountain made of modeling clay and soil, with a steep slope on one side and a gentle declivity on the other, was constructed on the floor of a daylight studio. On a curved wooden track covering a 90° arc, the camera, always 6 ft. from the mountain, faced it and a grayish background.

The observer first sees the mound against the "sky" from the horizontal. A line, produced by white worsted, gradually appears at the base. A card marked "sea level" flashes in on the line. At frequent intervals similar lines appear at proportionate 20-ft. heights. Cards announce 40 ft., 60 ft., etc. When the summit is reached, at 100 ft. in this case, the student has a realistic idea of elevations and slopes.

A map is formed on the screen by a gradual elevating of the camera through the 90° arc. One or two exposures are made at every minute progression. The perspective changes as if viewed from a rising balloon.

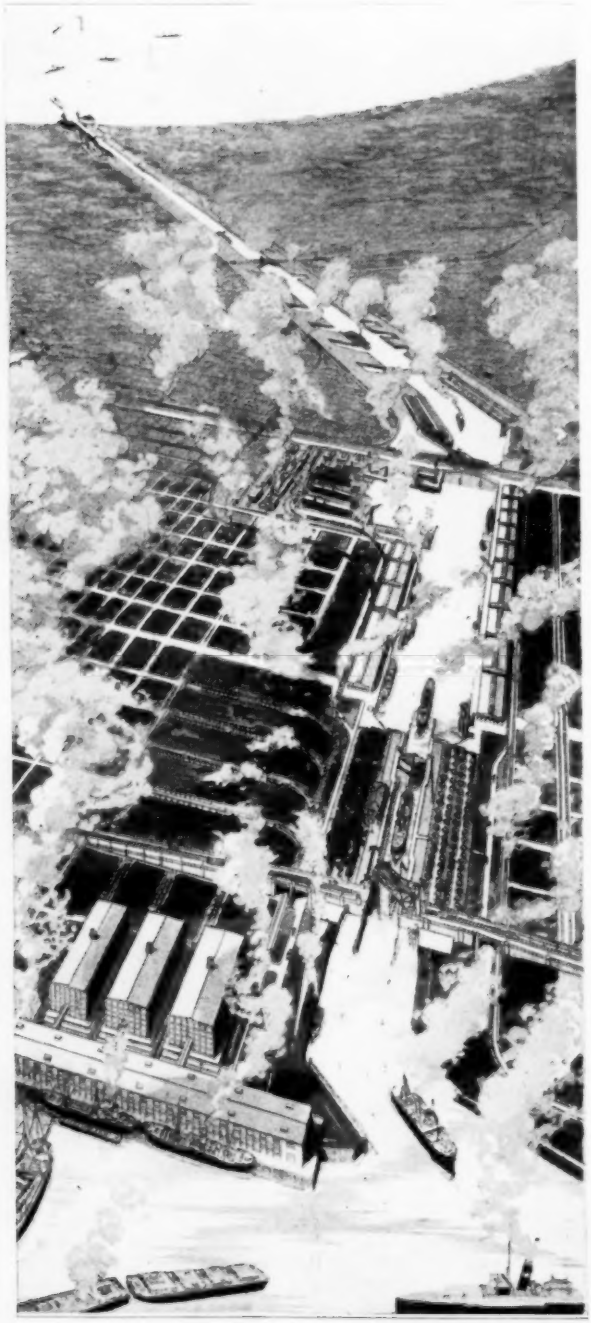
A series of elliptical white lines are seen from the perpendicular. The student notices that they are close together on the steep side and more separated on the gentle slope. He is then better able to interpret topographical maps and to help win battles.

BIG BRITISH AIRPLANE MOTOR IS THOUSAND HORSEPOWER

An airplane engine declared to be the largest yet produced, developing 1,000 hp. nominally and yielding 900 at regular working speed, has been completed at an English factory. Its 12 cylinders are arranged on the V-type, or "twin-six" plan, and its weight figures out at less than two pounds per horsepower. Though special planes are to be constructed for the giant motor, it will probably be tried out in some of the huge air craft recently built in England.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

CANAL WITHIN LIMITS OF NEW ORLEANS TO SERVE AS INNER HARBOR

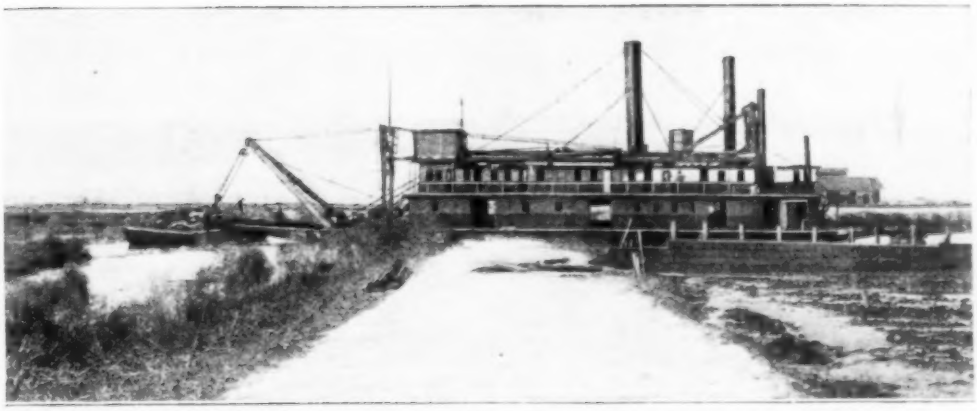


The Long-Standing Commercial Handicap Imposed on New Orleans by the Variable Level of the Mississippi River will Cease to Exist with the Opening of This Modern, Fixed-Level Ship Canal, Where Ocean Shipping will Find Commodious Harbor Facilities

WELL within the city limits of New Orleans, the state of Louisiana is constructing a deep industrial canal, which will serve as an inner harbor and give the entire port a greatly needed, fixed water terminal. It is a project unusual in construction and remarkable in engineering design, and will give the city an inland waterway rivaling in depth the Panama, Suez, and Kiel canals, and taking its place as one of the six greatest canals in the world.

The "Inner Harbor Navigation Canal of the Greater Port of New Orleans," as the new enterprise is officially called, will connect the Mississippi River with Lake Pontchartrain by means of a channel, six miles long, 30 ft. deep, and 330 ft. wide at the water level, with a bottom width of 150 ft. When completed, the canal will have industrial basins and ocean docks all along its length, providing suitable accommodations for ocean steamers and giving private industries their own wharves and docks, which has never before been possible. By means of this new waterway, the route from the Crescent City to the Gulf of Mexico will be cut approximately in half, as compared with the former outlet by way of the Mississippi. The lake now has a 14-ft. channel to the gulf, sufficient only for light-draft vessels and for coal-carrying barges, but this channel will also be cut to 30 ft., making it possible for larger steamers to reach the sea.

The inner-harbor improvement is expected greatly to augment the commercial importance of New Orleans, whose export and import business is already considerable. It solves for the city a problem that has always handicapped its growth as a port. By the state laws of Louisiana, which go back to the days of the Louisiana Purchase, the banks of the Mississippi are public property. No private owner may enjoy complete domination over the river front before his plant,



Construction of the Ship Canal has been Pushed with an Energy Which Is Unusual in Civic Undertakings. This Dredge has Just Eaten through the Macadamized Roadway, Encountered in Digging the Upper Portion of the Canal as Pictured on the Opposite Page

except by consent of the Levee Board and the governing authority over public wharves. Naturally, this has restricted private construction, and there are no private docks to speak of. Furthermore, the Mississippi River itself does not permit satisfactory or secure wharfage facilities. Not only has it a swift down current, but it is so affected by weather and seasonal conditions, that the high and low-water marks vary as much as 21 ft., while the normal rise and fall varies about 18 ft. Also, since the elevation of the city is below that of the river and all river property is leveed, the whole city is subjected to possible overflow and loss. Hence, all buildings along the river must be built to withstand the current and floods, which, in the soft alluvial soil of the district, is not a simple matter. Such plants as have been built are placed some distance from the water, which is another handicap in itself, particularly as some enterprises must have fixed-level navigable water with a private frontage.

All these idiosyncrasies of the Mississippi, however, with the problems and perplexities they have heaped upon the overburdened engineers, have now been completely nullified by the peculiar and ingenious

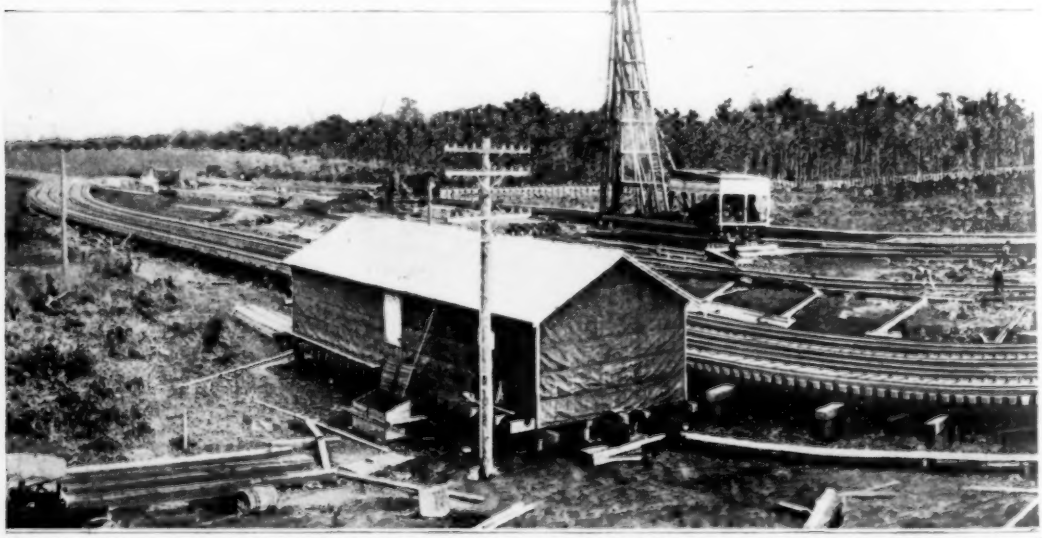
One of the Hydraulic Dredges has Here Encountered Some of the Most Difficult "Going" to be Found on the Six-Mile Job. The City will Countenance No Delay, However, as the Completed Canal is Expected to Prove a Tremendous Commercial Asset. It will Not Only Give New Orleans the Harbor Area Which She Now Lacks, but will Shorten the Ocean Voyage to New York by 160 Miles

From the Mississippi River the Canal Cuts through the City of New Orleans to Lake Pontchartrain, Seen on the of the Ground Which has Made Lock and Bridge Construction So Perplexing. The Soil Is of Poor Bearing was Designed as a Floating, Integral Structure Resembling a Huge Concrete Bathtub with Hinged Ends. It Is Pontchartrain. The Level of the Canal will Be the Level of the Lake.

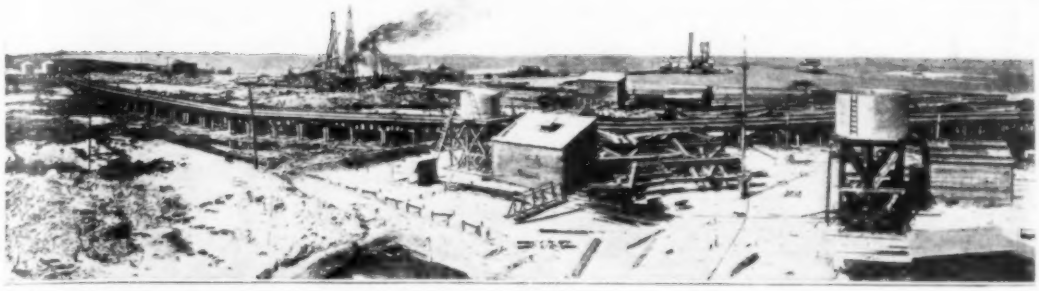
construction of the canal, which for the most part will have a fixed water level, taking water from Lake Pontchartrain and varying only as the lake itself does, which is a negligible amount. This is accomplished by a most remarkable lock, so built as to withstand the differing pressures of the water from the river on one side and from the lake on the other, while at the same time it protects the city from being flooded by the canal water.

The line of the new inner harbor and canal is approximately five and seven-eighths miles long, running east and west in the form of two tangents. A vessel passing from the river to Lake Pontchartrain enters the canal on a short turn, which makes access to or from the down current easy. The incoming ship soon encounters the lock, about a mile from the river entrance, which holds back the river and keeps the water in the canal at the level of that in the lake. As, for practical use, no canal is wider than its lock, the dimensions of that at New Orleans are important. It will accommodate ships of more than 60-ft. beam, about 600 ft. long, most 10,000-ton vessels being able to pass. Two ocean-going steamers can pass side by side in the canal.

After passing through the lock, the ship enters the inner harbor, on either side of which are to be public wharves. A large, rectangular turning basin, 1,000 ft. long and 875 ft. wide, will extend from the canal line, giving special facilities to the shipbuilding plant located at this point, near an important bridge carrying city traffic and adjacent to the second tangent of the canal. From there on, the



Near the Entrance to the Mississippi River, the Government is Building Great Warehouses for the Storage of have been Purchased by Shipbuilding Companies. The Canal Offers the Varied Industries of New Orleans Their



Right. The Panoramic View Shows the Northern End of the Canal, and Suggests the Unstable Character This Lock Which will Compensate for the Varying Differences in Level between the Mississippi and Lake Value. While Rock Bottom is Not Found Less than 1,800 Feet from the Surface. For Just This Reason the Lock Which is, of Course, Unaffected by the Caprices of the River

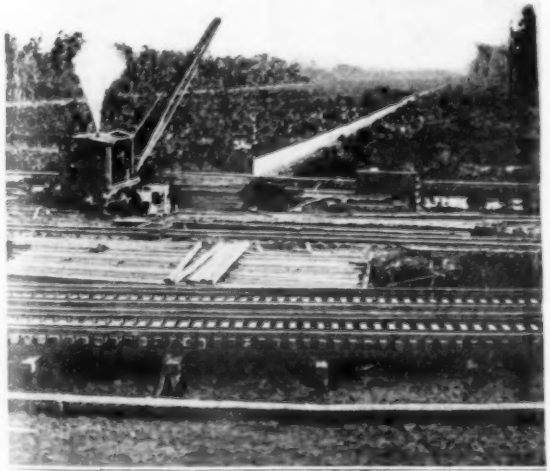
canal runs straight to the lake, the shores being equipped with steamer slips, arranged in an unusual way.

These slips extend for 1,000 ft. on either side of the canal and are 225 ft. wide, 650 ft. long, and 225 ft. apart. Here eventually will be erected permanent terminals, docks, and piers of private enterprises. The arrangement of the slips is such that there is no need of turning basins. A vessel, to leave such a slip, simply backs out into the main channel and over to the opposite side of the canal, and turns, having enough leeway to go out by the bow.

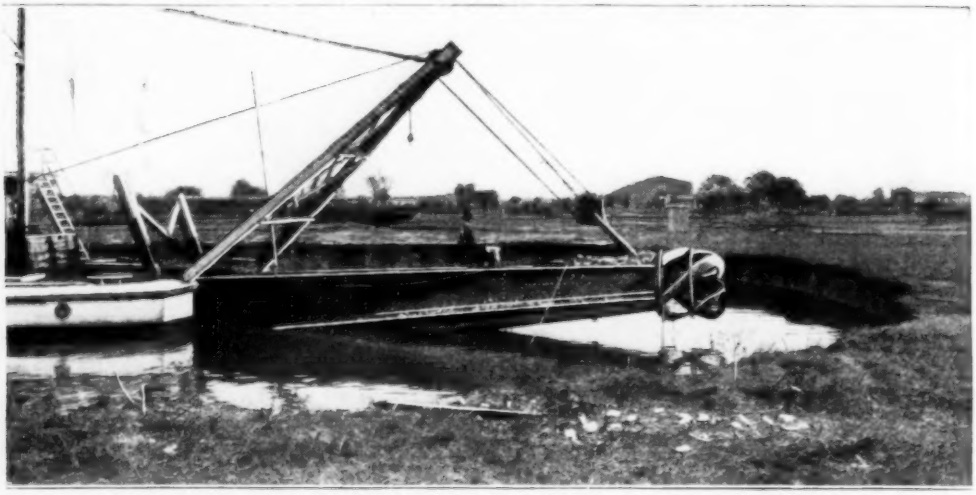
The lock itself is a remarkable device, 75 by 1,000 ft. in size, and solves a problem that has puzzled engineers for some time. The chief difficulty has been to keep the canal water at an even height, and to hold back the Mississippi water. Moreover, the soil all through the district is of such a loose nature and rock bottom so far under the surface, that some way had to be determined to make the lock secure and free from the possibility of a breakdown. So the lock was built as a "floating structure." The base is simply a thick concrete slab resting on a foundation of piles, driven within a cofferdam extending beyond the area of the base of the lock. Reinforced-concrete walls act as slabs which transmit the pressure of the water to the base, through diagonal struts at the top.

The most unusual feature of the lock is, perhaps, the arrangement of the gates, which miter in either direction. In this way, the reverse pressure of the water, due to the variations in the level of the lake and the river, is kept under control. The lock is also equipped with safety devices that prevent the flooding of the city from the canal, if there should be a break or failure in the lock gates. At the head of the lock is located a drawbridge, carrying city traffic, which will be interlocked with the gates, so as to form a dependable protection against collision with ships. A revolving bridge, to be mounted on the lock wall, will permit the ready placing of caissons across the lock in case of accident, or some other emergency, during the high-water periods of the river.

In the more congested parts of the city, there are four bridges over the new waterway, which carry across it railroad tracks, electric-car lines, and city streets and sidewalks. Some of the greatest difficulties in digging the channel, now practically completed, were encountered in clearing out the land east of the last bridge selected for the canal route. Miles of forest-covered land had to be cleared. The sides of the channel were



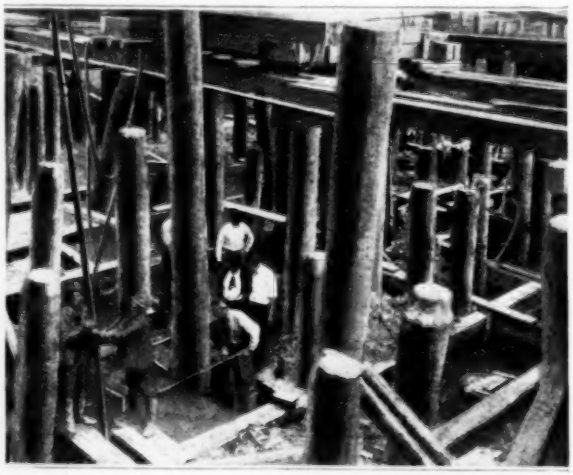
Supplies. Other Available Portions of the Canal Frontage First Opportunity to Possess Normal Docking Facilities



A "Fleet" of These Dredges was Used in Pushing the Six-Mile Cut from Lake Pontchartrain to the River. The Completed Cut Measures in Cross Section 330 Feet at the Top, 150 Feet at the Bottom, with a Depth Throughout of 30 Feet

fenced off and filled in. Half a dozen, or more, dredges equipped with cutters practically ate their way from the lake, to connect with the excavation work being carried on in the opposite direction. At one point, a dredge practically "ate up" a well-established road.

The improvement, which is being built by the State Board of Port Commissioners, will cost in the neighborhood of $12,000,000. It is calculated that the main channel alone will give at least 50,000 ft. of water frontage, where industries can be established, and by a system of lateral canals this may be increased to 25 miles of wharfage space. An eight-mile waterway is also planned to connect with Lake Borgne.



The Soft Soil Made Heavy Piling a Necessity for Each of the Four Bascule Bridges, All of Which will Carry Heavy Traffic

The new canal system will be coördinated with the railroads, by means of the Belt Line Railroad of New Orleans, one of the few municipally operated roads in the country. This will serve all the piers and terminals along the route, and connect them with the trunk-line railroads entering the city. The inner harbor will, therefore, be readily accessible to the transportation facilities of the port and give private enterprises the secure wharfage and the rail and water connection so essential to them.

The restrictions brought about by the war did not interfere with the work on the canal. In fact, because of the shipbuilding and other war industries which would be aided by this route, the government expedited the construction and built three great depot warehouses, six stories high, at the river entrance, giving it facilities for storing 178,500 tons of miscellaneous goods and a wharf and storehouses nearly half a mile long. This was a development of the commodity-warehouse idea, planned by the dock board, to enable coffee, hides, and all other incoming and outgoing cargo to be stored in a place where it would be accessible to either importer or exporter.

While the dredging of the channel has been completed, there is still much to be done, and the inner harbor will not be ready for complete use, with the lock, until sometime next year. Vessels will be able to pass into and out of the canal via the lake this year, but not to complete the journey to the Mississippi River until 1920.

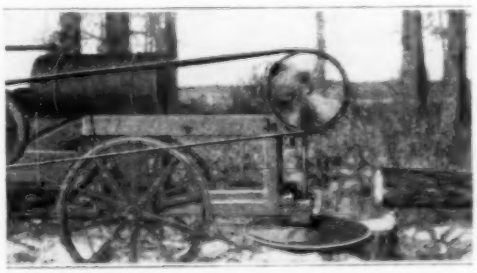
There has been some talk of the possibilities of the government declaring New Orleans a free port, but that awaits action by congress. In case it is favorable New Orleans will naturally become one of the import centers of the country, and the industrial canal will become a free zone; but in any event, the authorities expect that the canal will have the effect of making New Orleans the port of deposit and the industrial port of the South, thereby greatly adding to its commerce.

GREAT DRY DOCK CONSTRUCTED IN HAWAIIAN ISLANDS

Large enough to accommodate the biggest naval vessels afloat, or likely to be built for some time to come, the enormous dry dock, which has been under construction for several years, was completed recently at Pearl Harbor, Hawaii, the latter the most extensive island in the group of the same name. It was constructed by the navy, and is considered the most difficult work of its kind ever attempted by the department. The structure is 1,001 ft. long, 32½ ft. deep, 114 ft. wide at the bottom, and 138 ft. wide at the top.

TRACTOR SAWS DOWN TREES BY SIMPLE ARRANGEMENT

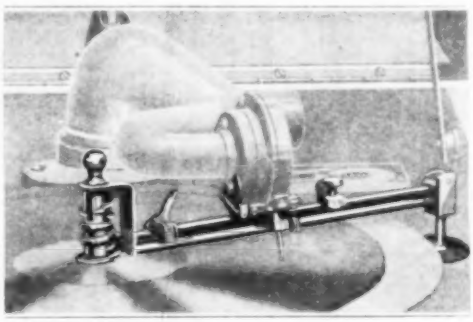
Tractors are not being given much chance to rest, because their farmer owners are constantly discovering new uses for their power. Rather unusual is the application of a Minnesota farmer, who is using his tractor for cutting down trees. A timber frame on the front of his machine holds a vertical shaft, at the bottom of which is mounted a circular saw. Gearing at the top allows the saw to be run by a belt from the tractor's power pulley, and to be fed by moving the tractor forward.



Timber Frame Rigged on Front of Tractor, with Belt-Driven Circular Saw at Bottom of Vertical Shaft, for Cutting Down Trees

PHONOGRAPH REPEATS RECORD WITH NEW ATTACHMENT

When the needle comes to the end of its travel and the music ceases, the owner of a phonograph equipped with the latest attachment takes no heed, and a moment later the machine is playing the same air over again. This interesting result is achieved by means of a metal arm pivoted at a point outside the turntable, its inner end resting upon the projecting tip of the spindle. At the end of the record, the traveling sound box engages a trigger which actuates a vertical screw, and the metal arm rises, lifting the needle from the record. The sound box slides back along the inclined arm to its starting position, the descending arm replaces the needle accurately in the outer groove, and the music goes on.

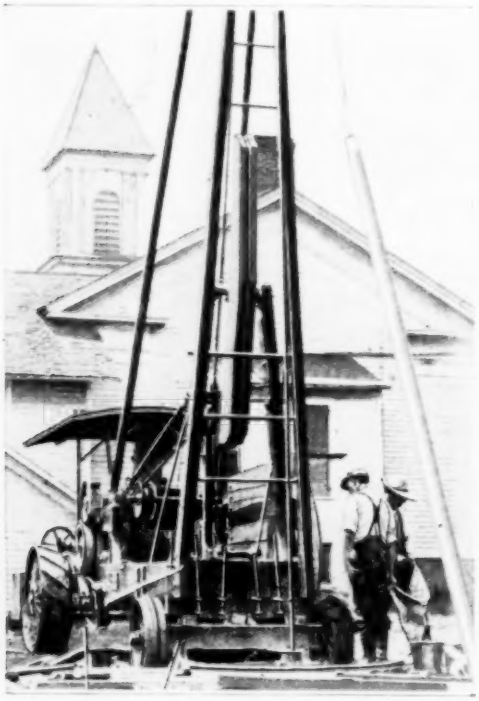


New Phonograph-Record Repeater: An Attachment with an Arm Which Rises at the End of the Selection and Slides the Sound Box Back to the Beginning

¶ Rifle fire is recommended by the Navy Department Bureau of Ordnance for sinking drifting mines. Usually this method will not cause explosions, it is declared, but, as a measure of safety, it is advised that firing be done at 500 yd., and that crews of ships be protected from flying fragments even at that distance.

OHIO VILLAGE TRANSFORMED BY DISCOVERY OF OIL

To the tales of strange results produced by oil discoveries should be added the story of the Ohio village (Chatham) that



Oil-Well Drill at Work in the Yard of an Ohio Village Church: The Town is Situated in the Center of a Recently Discovered Petroleum Field

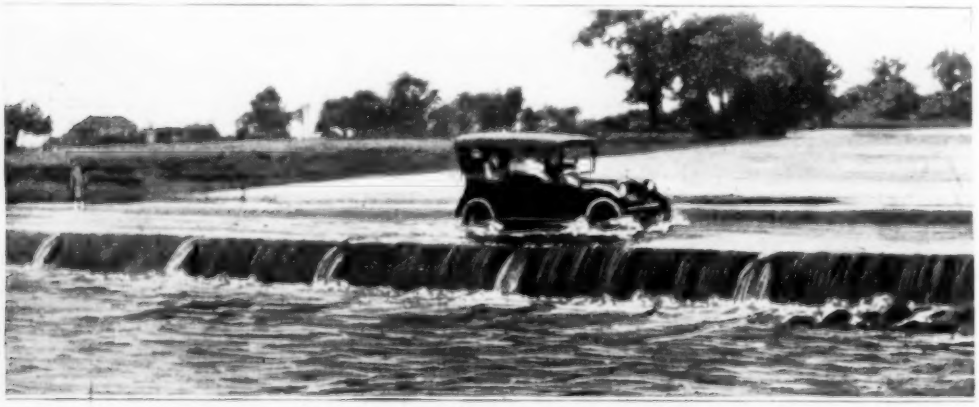
awoke one morning, a few months ago, to find itself in the center of a petroleum field. Drills were set up in every yard. Even the churchyard had its boring machine, placed within a few feet of the house of worship. A well was dug in the town's public square. It proved worthless, but 50 ft. away, in the dooryard of the only physician in the place, there are three valuable producers. The field is about 10 miles long a..d five miles wide, and the oil is about 450 ft. below the surface. Some of the wells are producing as much as 250 bbl. of oil daily.

LEAD-COATED TURBINE BLADES RESIST ABRASION BY SAND

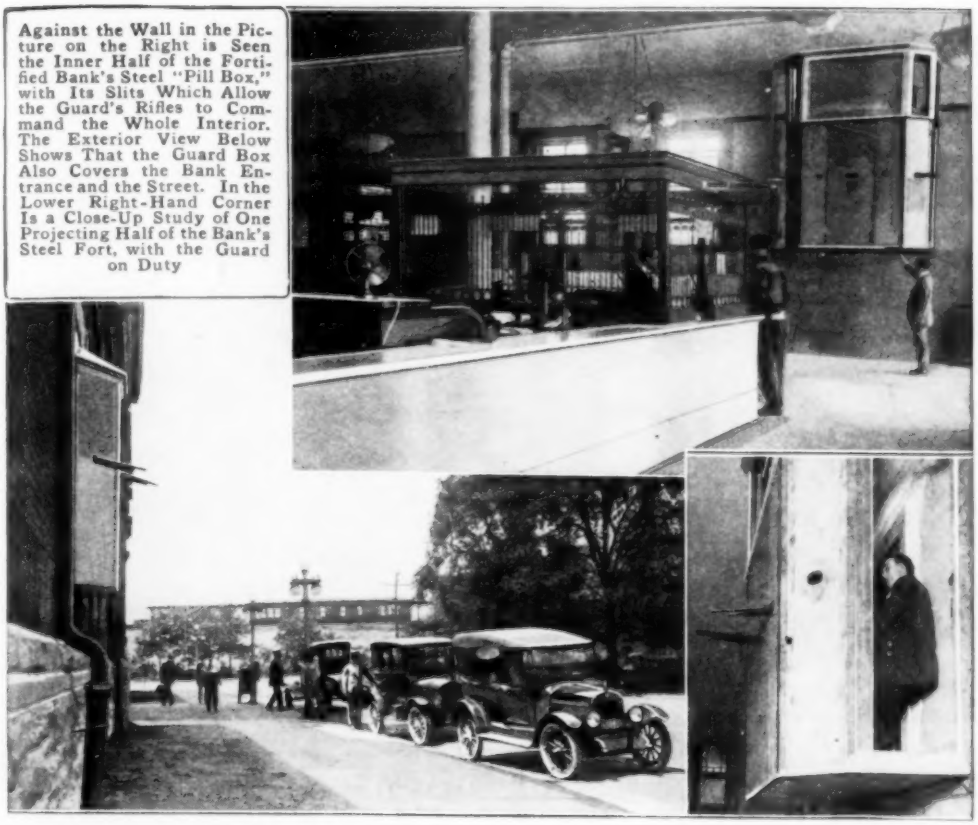
Wearing away of water-turbine blades is caused by particles of sand suspended in the water, ultimately having all the effect of a sandblast. It has been discovered that a thin coating of lead, applied to the blades by the metal-spraying process, actually stops all abrasion, the sand instead driving the lead into even closer cohesion with the iron. The application of this process should prove valuable to hydroelectric plants.

LEVEL FORD ACROSS RIVER ON TOP OF LOW DAM

The broad top of a low concrete dam across the Des Plaines River, near Chicago, forms a level, shallow ford which is used by automobiles and other vehicles, as well as by barefooted pedestrians. Crossing the structure in a motor car is a more or less thrilling experience, because of the water splashed by the wheels of the machine. It is, however, a perfectly safe trip. The surface of the submerged roadway is roughened to provide good traction.



A River Ford on Top of a Concrete Dam: Automobiles Splash through the Few Inches of Water That Flow over the Obstruction, While Pedestrians Remove Their Shoes and Stockings, and Walk Across



Against the Wall in the Picture on the Right is Seen the Inner Half of the Fortified Bank's Steel "Pill Box," with Its Slits Which Allow the Guard's Rifles to Command the Whole Interior. The Exterior View Below Shows That the Guard Box Also Covers the Bank Entrance and the Street. In the Lower Right-Hand Corner Is a Close-Up Study of One Projecting Half of the Bank's Steel Fort, with the Guard on Duty

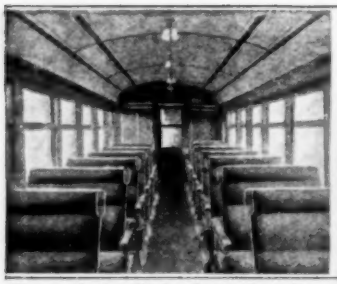
BANK GUARD STANDS WATCH IN LOOPHOLED TURRET

Bank robberies in the outlying districts of Chicago have become so frequent that one president adopted a suggestion from his son and cashier, formerly a lieutenant in the A. E. F. In France the son acquired a wholesome respect for the little steel and concrete "pill boxes" used with such murderous effect by the Germans. So the bank now boasts a steel "pill box" of its own. It replaces a large window and is located in a strategic corner, where the guard's high-power riot guns command every part of the interior and all exits. The fort being built half inside and half outside, the guard may miss his men within and still get them as they attempt to leave the building.

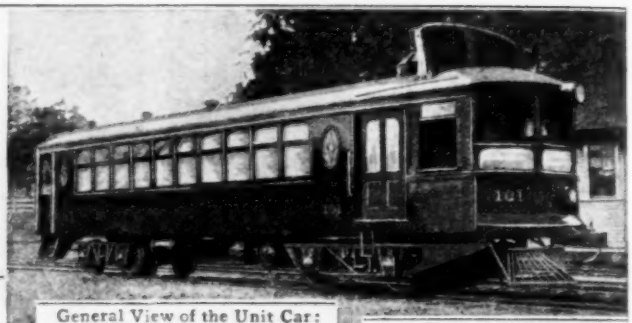
¶Talking machines will play an important part in the presidential election campaign of 1920. Both the leading political parties have announced plans for distributing to all parts of the country phonographic records of speeches.

RECLAMATION OF CITY WASTE ENCOURAGED BY GOVERNMENT

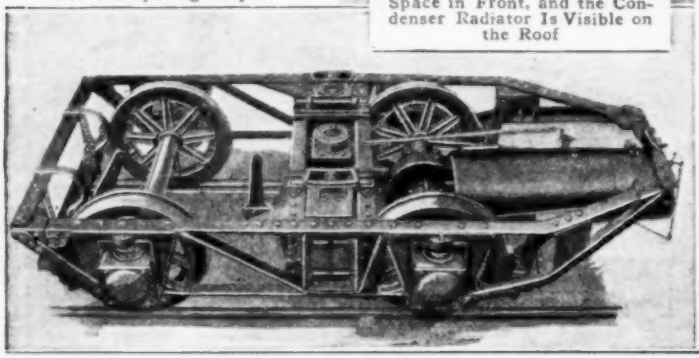
Though American industry prides itself on the value of its by-products, rescued in most part from so-called waste materials, the truth is that the mine of utility in the nation's waste has scarcely been touched. War needs brought to light vast supplies from unsuspected sources, in the shape of thousands of tons of discarded clothing, paper, and other familiar materials. The most important feature of this resurrection, still generally unrecognized, is not its monetary value, but its ability to replace natural products which are either practically exhausted or desperately scarce. That the systematic collection of this material is a work for the community, more than for the individual, is beginning to be realized. The city of Akron, Ohio, has already put such a campaign into action, and so well is it operating that the Waste Reclamation Service of the Department of Commerce has issued a special booklet on it for distribution to other organizations.

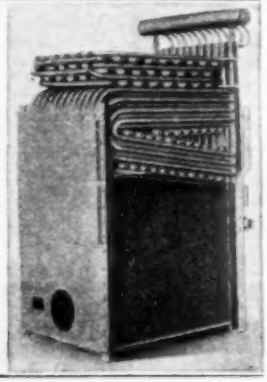


View of the Unit Car's Interior, Indicating That the Appointments Are of Standard Railroad Quality and the Spacing Ample



General View of the Unit Car: The Boiler Room Occupies the Space in Front, and the Condenser Radiator Is Visible on the Roof

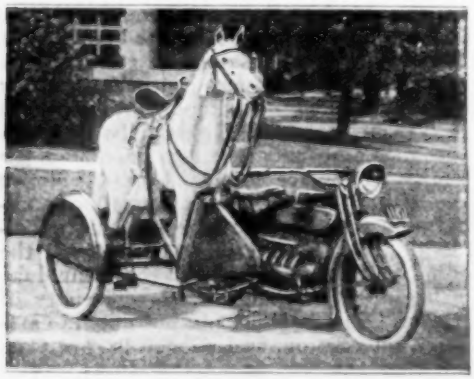




The Front Truck Carries the Engine, as Seen in the Left Picture. It Is of the Two-Cylinder Inclosed Type, the Forward Wheels of the Truck being Mounted Directly upon Its Crankshaft. At the Right Is the Compact Water-Tube Boiler, with Its Fire Box at the Bottom and Steam Drum at the Top

PONY ON MOTORCYCLE USED IN PUBLICITY CAMPAIGN

Although not to be recommended as a comfortable vehicle for cross-country travel, the motorcycle-mounted pony, recently displayed in an eastern city, served its purpose well—that of attracting attention. The steed, done in papier-mâché, was mounted on the sidecar chassis.



The Fertile Imagination of the Advertising Man Is Responsible for This Odd Vehicle. On Its Trip through the City Streets the Steed Bore a Cowgirl

ENGINE AND COACH ARE ONE IN NEW RAILWAY UNIT

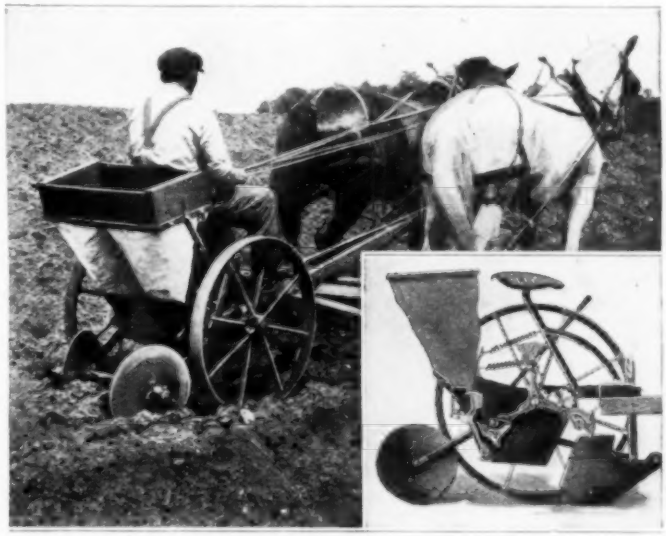
A railway coach which contains its own locomotive, steam-driven and burning petroleum in a modern water-tube boiler, has been produced as a cure for the economic distress on railroad lines whose passenger traffic is inadequate to meet the customary expenses. Externally the new car gives little indication of its power equipment. It is 50 ft. 7 in. long over all, and seats a total of 42 passengers, to whom it offers all the comforts and conveniences of modern railway practice. The 8-ft. boiler room, steel-lined, occupies the front end and contains an efficient water-tube boiler, burning crude or refined oil and generating steam at 700 to 1,000-lb. pressure, superheated to 650° F. The two-cylinder piston-valve engine is mounted directly on the front axle of the forward truck, and develops normally 60 hp., which in an emergency may be considerably increased. The condensing radiator is carried on the car roof. The car, which weighs about 30,000 lb., makes 45 to 60 miles an hour.

GIANT CAPRONI PLANE FALLS WITH FIFTEEN PASSENGERS

Most terrible and most mysterious of all airplane accidents was the fall of a giant Caproni, all ablaze, from a height of 5,000 ft. in Italy a few days ago, in which 15 passengers were killed. The big plane, which was attempting to make a new speed record from Venice to Milan, was seen suddenly to burst into flame near Verona. All on board, including seven newspaper men, one representing a Chicago paper, were burned to death, destroying any possible clew to the cause of the fire.

ONE MACHINE PLANTS, ANOTHER DIGS, POTATOES

Potato growing has become almost an automatic industry with the improvement of specialized machinery for its operations. An interesting form of potato planter that has lately come into successful use carries the seed in nonclogging hoppers of canvas and drops them at specified intervals, in straight, regular rows, into a furrow it has plowed. A pair of disks at the rear then cover the seed, with which fertilizer may also be fed into the ground if desired. Equally valuable is a digging machine, which plows up the potatoes, catches them on a conveyor that shakes them clean, and lays them out behind ready for loading. The chain links of the conveyor are steel rods, 22 in. long, transversely mounted, making a ladderlike chain of great capacity that handles the potatoes without bruising them.



The Potato Planter Digs Its Furrow, Drops Seed from the Canvas Hopper, with Fertilizer if Desired, and Then Covers Them by Means of the Disks at the Rear. The Sectional View in the Corner Indicates How the Seed is Released by a Triple "Mechanical Hand"

As Seen Above, the Potato Digger Has On Wheel Bands for Hauling to and from the Field; the Digging Plow and Ladderlike Conveyor Are Visible. At the Right Is the Machine in Action

NAVY DEPARTMENT COLLECTS PICTURES AND LETTERS

Photographs taken by private individuals in naval camps or aboard ships, personal letters written by sailors, and any other similar material that pertains to the activities of the navy during the war, are to be placed in permanent files at Washington, D. C., by the Navy Department. They will form a historical collection intended to preserve a viewpoint of the hostile times not contained in official documents. A request has been made that such items of interest be sent to the historical section of the department for examination. Description should accompany photos.

MOUNTED POLICEMEN THRILL THOUSANDS AT CARNIVAL

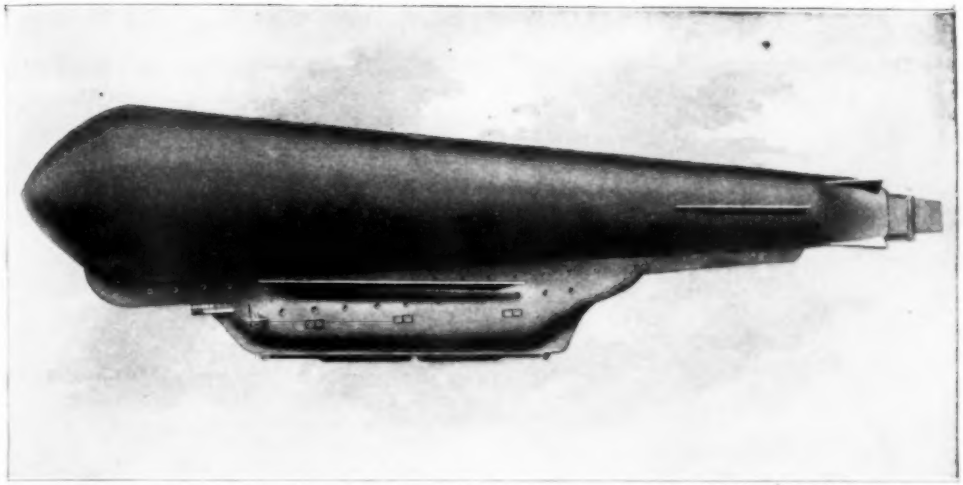
Hair-raising feats of daring and skill thrilled the thousands who attended the carnival of the New York City police department at Sheepshead Bay recently. Of particular note were the horsemanship exhibitions. These included a sensational Roman race, in which each rider guided three barebacked horses, running abreast, while standing with a leg on each of the outside animals. Another feature which elicited gasps from the spectators was the catching of a "runaway" team of horses, hitched to a victoria, by two mounted policemen. The occupants of the vehicle were members of the force, dressed in women's clothing. A jousting tournament was held, the participants, mounted on horses, being armed with wooden lances and protected by masks. Fifteen airplanes from nearby aviation stations gave an aerial drill, and the antics of a small army of clowns amused the spectators.

Stopping a "Runaway": Two Mounted Policemen Dashingly "Rescued" Other Members of the Force, Dressed in Women's Clothing and Riding in a Victoria

VALUE OF ALTITUDE FLIGHTS TOLD BY RECORD HOLDER

The serious significance and importance of experimental flights at extreme altitudes was described by Roland Rohlfs just after the recent triplane flight in which he established the American record of 30,700 ft. While such events carry a sporting flavor, their real value lies in the new meteorological fields they explore, and the scientific observation, available in no other way, that they make possible. Conditions of temperature—as low as 25° below zero in midsummer—of air rarefaction, of wind velocities as high as 200 miles an hour, of the physiological effects of altitude, are some of the facts now recordable, but hitherto considered only theoretically. Of equal importance is the study of engine behavior under the influence of cold and rarefaction. The successful routing of air lanes for future commercial flight depends upon the study of the greater speeds possible at higher ranges, the change in wind direction in various strata, and other carefully recorded data. Experienced fliers already know that by going high enough, they are fairly certain to find air currents favorable to the direction of their travel. And altitude study has helped to develop mechanism for maintaining the carburetor air at constant pressure regardless of height.

One of the Sensational Features of the New York Policemen's Carnival at Sheepshead Bay Was a Roman Race, in Which Three Barebacked Horses were Ridden by Each Participant, as Shown in the Picture



The "Thermos Bottle" in Flight: Revolutionary in Construction and Principle, This Steam-Driven Airship, Constructed Entirely of Metal and Depending for Its Buoyancy on the Lifting Power of Heat-Expanded Air, Claims Immunity against the Fate of So Many Lighter-Than-Air Craft—Destruction by Explosion of the Gas Bag—and Greater Safety from Purely Mechanical Accidents. The Nacelle, Built Integrally with the Envelope, Is Sturdy Enough to Travel the Sea Supporting the Whole Ship

RIGID ALUMINUM DIRIGIBLE GIVEN BUOYANCY BY HEATED AIR

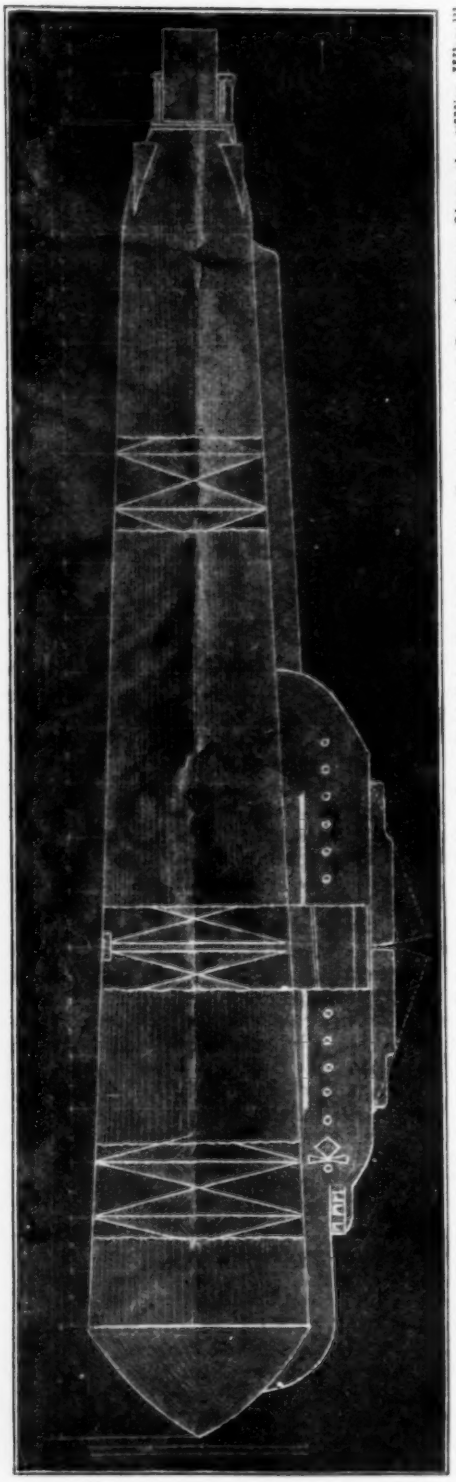
By RALPH C. BUSBEY

THE world's first all-metal dirigible, a monster, steam-propelled "thermos bottle" buoyed up by heated air, is now under construction, and before the end of the current year is expected to make its maiden trip across the Atlantic Ocean. The inventor has secretly labored on his unheard-of craft for six years, spurred on to increased activity during the last few weeks by the "blimp" disaster which horrified the city of Chicago. Because that holocaust, he believes, showed the world that the commercial dirigible of the future must be something other than a combustible combination of hydrogen gas, thin silk, fragile framework, and fire-spitting gasoline engines, he feels that the very same disaster which overtook the "Wingfoot Express" lurks in the gas-filled ballonets and complicated framework of the "R-34" and every other dirigible now in operation. Such a disaster, with the elaborate, costly precautions taken against a recurrence, have led him to believe that airplane and dirigible construction must be completely revolutionized in order to insure that degree of safety without which the phase of commercial utility cannot be reached.

Of course, the use of helium gas—the United States' war achievement—which is noninflammable, would obviate the danger, but this has not yet been produced in sufficient quantities to make it commercially available.

"Revolutionary" is exactly the word to describe the steam-driven, noncollapsible cruiser of the skies on which the inventor is now at work; it is revolutionary in both principle and design. For the "gas bag" is really no bag at all; rather a truncated portion of a slender cone, streamlined at bow and stern, and constructed throughout of a light, strong aluminum alloy. Rigidity is furnished by a central longitudinal tube, 6 in. in diameter, from which radiate "spokes," as in a bicycle wheel, every 15 ft., this odd construction eliminating all chance of structural failure and collapse. Transverse diaphragms, or partitions, also every 15 ft., divide the 388 ft. of the length into 20 hot-air compartments, with a capacity of some 500,000 cu. ft., leaving 31 ft. at the bow for streamline, with 57 ft. at the stern for streamline and rudders.

The craft derives its aerial buoyancy from heated air which is maintained at a determined temperature by large kerosene burners, placed beneath each of the 20 compartments. Expansion and consequent rarefaction of the heated air is provided for by valves automatically controlled from the pilot's cabin. Similar valves, with suction fans and pumps, permit rapid intake of cool air for descent, when it is desired to cruise at a lower altitude. To prevent loss of this heat to the outside air during normal,



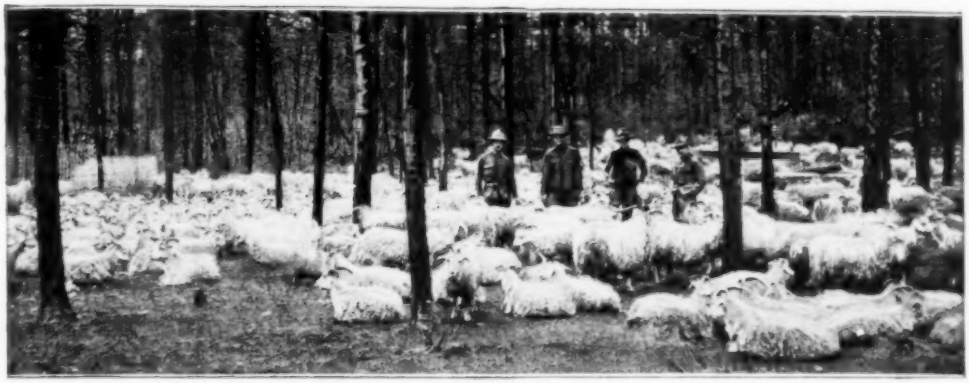
This Diagram Gives an Idea of the Shape and the Interior Construction of the Dirigible, Portions of the Envelope being Cut Away to Show the "Wire Wheel" Bracing and the Air Chambers. The Hinged Members at the Bottom of the Hull Serve as a Stabilizer in the Air and as a Keel on Water

horizontal flight, however, the taut metal envelope is double-walled throughout its length, the intervening 4-in. space being filled with a special insulating material. The composition of this insulation is naturally one of the inventor's most jealously guarded secrets. It is evident, nevertheless, that such insulation will not only conserve fuel, but will make the dirigible insensible to the variations in atmospheric temperature which so seriously affect the ordinary "thin-skinned" dirigible. It is this "lining," by the way, combined with the gleaming metal skin, which has prompted the inventor's associates to nickname his craft the "Thermos Bottle."

Carried under the forward part of this metal "gas bag," and forming an integral part of the structure, is the metal gondola, about 160 ft. long, and of seaworthy construction fit to withstand the heaviest seas. Herein is the navigator's cabin, containing controls to fans and air pumps, thermostats which regulate temperatures in each of the 20 air compartments, means for lowering the centerboard keel for travel on the water, as well as all the conventional navigating controls and instruments. In the engine room is generated steam which not only enables three engines of 1,500 hp. each to turn the great air propellers, but even circulates through radiators in passenger cabins, crew's quarters, and recreation salons, insuring comfortable warmth at the highest altitudes. The inventor's consistent purpose has been to provide the traveler with every comfort he has grown to expect on the large ocean liners, not the least of these being the passenger's freedom to smoke his cigar in any part of the interior.

The performance of the all-metal, hot-air dirigible is now admittedly a matter of conjecture. Free from the usual aerial dangers of fire and collapse it certainly will be. It should be efficient in speed and lifting power. When heated to 200° F., it is computed that the air in the 20 compartments will possess a lifting power of 10,280 lb., or more than five tons. And as the kerosene heaters are designed to raise the temperature to 700° F., if necessary, it is seen that the lifting power will be ample to insure commercial profit. And for use in war the hot-air dirigible will be without a peer. Battling a fleet of hydrogen-filled Zeppelins, it should send them one after another to blazing destruction, though half its own hot-air compartments be riddled by incendiary bullets.

GOATS USED IN TESTING POISONOUS WAR GASES



One of the Herds of Goats Kept by the Government for Testing Poisonous-Gas Shells Made for the Army during Hostilities: The Horned Animals Have High Powers of Resistance against All Gases

Goats were used to test poisonous gases made for the army during the world war, it became known recently when some of the secrets of the Chemical Warfare Service were revealed by military authorities. Large herds were purchased by the government after it was learned that the animals possess strong powers of resistance against practically all gases, and the beasts were kept at plants where gas shells were manufactured.

Goat Trench for Gas Tests: A Gas Shell was Exploded near the Goats, and Afterward They were Killed and Their Lungs Examined

In making the tests, a few goats were placed in a trench, similar to those used by soldiers, and a gas shell was exploded near them. Immediately afterward, these animals were killed and their lungs examined to ascertain the effects of the poison. Using this information, experts compiled tables to indicate the number of shells of a certain strength necessary to explode in a given area in order to obtain the maximum results.

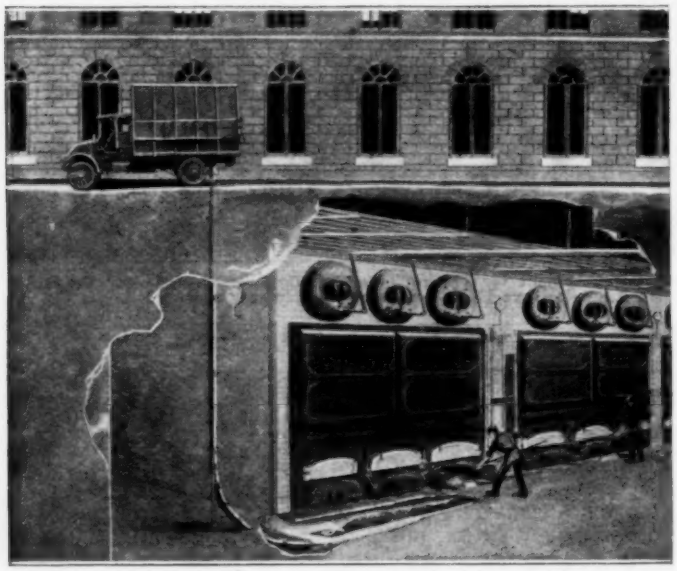
Toxic gases caused from 25 to 30 per cent of the casualties of the war, but only about three or four per cent of the gas cases resulted fatally.

VERTIGO AFTER TAIL SPIN IS DANGER TO FLIERS

Vertigo following a tail spin, voluntary or involuntary, is a familiar phenomenon to fliers, and is, of course, nothing more nor less than the natural sense of dizziness after a whirl. The victim continues to imagine rotation after he has stopped. As a result, on straightening out he is likely to operate his controls too far in the reverse direction, and so actually go into another undesired tail spin the opposite way. Officers who have studied the condition and its dangers have found that holding the head well down under the cowl during a spin, to some extent overcomes the misleading sensation by centering the rotation about the long axis of the pilot's head. On coming out of the spin the continued sensation of whirling is then in a horizontal plane, and much less dangerous, because it does not tempt the flier away from an even keel.

REMOVING ASHES BY SUCTION SAVES LABOR AND DUST

Ashes are now being removed from certain large buildings in New York City by a sort of magnified vacuum-cleaner system, with entire success and relief from dust. Before the boiler plant in each building is a concrete pit, three feet in width and depth, from which a pipe extends to the street level and terminates beneath the sidewalk. A truck carrying the apparatus connects its suction pipe with this terminal, and a powerful blower quickly extracts the ashes, which enter a bin and are subsequently dumped into another truck to be carted away. The waste air is washed to remove dust before being discharged.



From the Concrete Ash Pits in Front of the Boilers, a Pipe Extends Up to the Street, and a Vacuum-Cleaner Truck Quickly Draws Out All the Ashes; the Truck Has Dump Sides and an Air Washer

COATINGS PROTECT CONCRETE FROM SEVERE HEAT

Concrete made with coarse gravel is capable of withstanding heat with less danger of disintegration if protected by a coating of cement, 1 in. thick and reinforced with wire mesh, according to the Bureau of Standards. Plasters made with asbestos as their chief ingredient can be used for the same purpose. High temperatures cause stones to burst, which results in damage to the material in which they are imbedded.

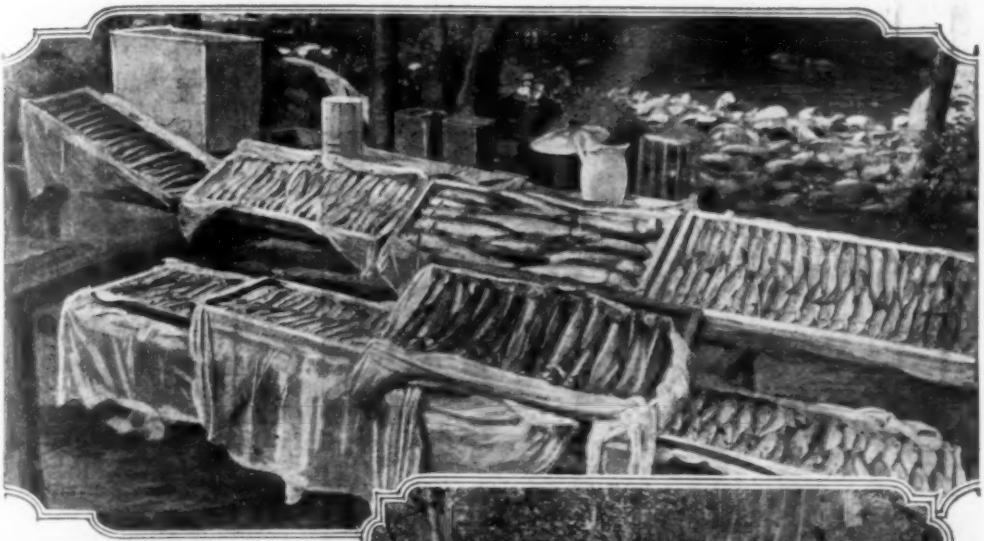
WANT SEMIAUTOMATIC RIFLE FOR AMERICAN ARMY

Inventors are asked by the U. S. War Department to submit designs for a new semiautomatic shoulder rifle, to use, preferably, the standard .30-caliber cartridge. Simplicity, ruggedness, and resistance to sand, dust, and water are primary requirements. The arm must not weigh over 10 lb., and its clip-loading magazine should hold preferably 10, and at least five cartridges. Normally firing once for each trigger pull, it should also be usable as an ordinary hand-operated magazine rifle. Emphasis is placed on the desirability of following as far as possible the design and construction, and using parts of the present standard service arms. Some of the special requirements are that the breech block must be locked to the barrel while firing, that an effective safety device must be provided, and that dismounting should be accomplished with one tool, preferably with a cartridge.

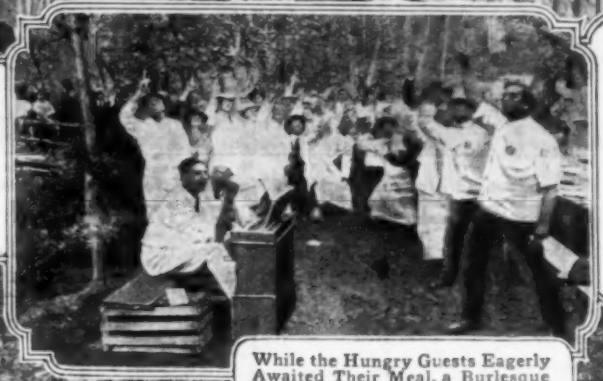
DERANGED CAPTAIN PERILS SCHOONER AND CREW

With an insane captain in charge, a small wooden schooner and its crew of seven men came near being lost recently when the vessel encountered a severe storm off the coast of Wales on a voyage from Swansea, England, to Calais, France, with a cargo of coal. The master's derangement first became apparent when he ordered sails hoisted while the gale was blowing strongly, and headed the craft shoreward. When land was sighted, he demanded that the schooner be run ashore, at the same time issuing other absurd commands. Then the mate took charge of the battered ship, and finally hailed a tug to tow the vessel to port. In the meantime, the captain continued his eccentric actions, and terrorized the crew by firing a revolver at various objects. After wounding one man, he was made a prisoner in his cabin, where he shot himself through the head and died.

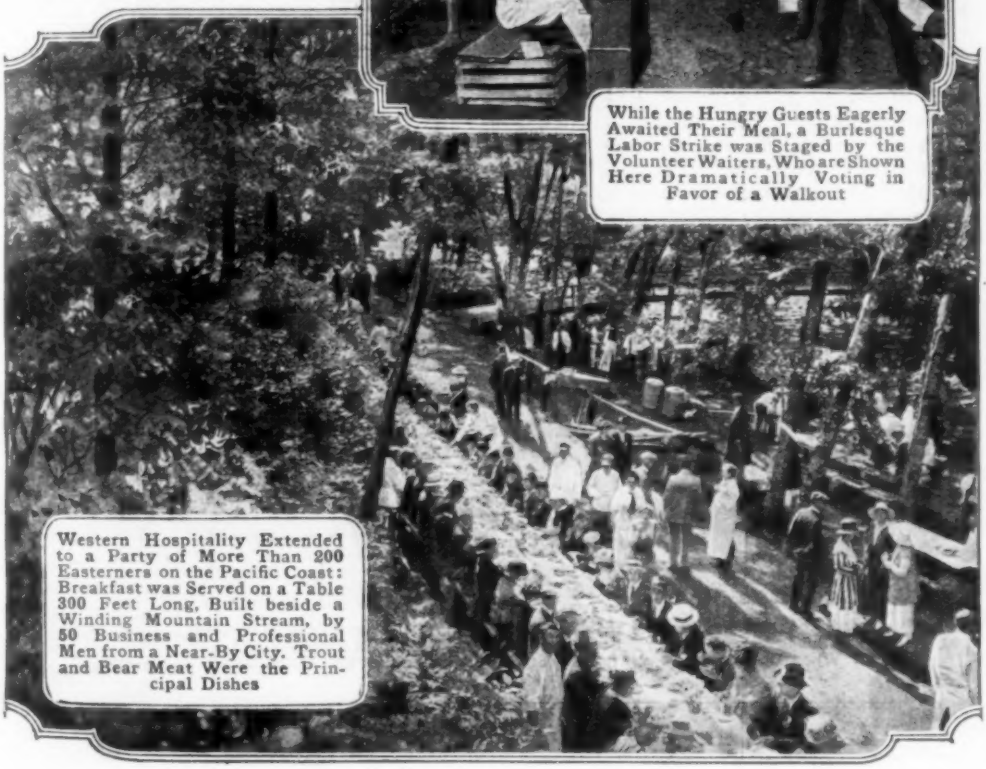
TWO HUNDRED EAT BREAKFAST AT OUTDOOR TABLE



The Culinary Department: Some of the Mountain Trout That Delighted the Visitors are Pictured, Ready for the Hands of the Cooks. On the Stove in the Background are to be Seen Pots of Steaming Coffee, Which Added to the Pleasure of the Repast



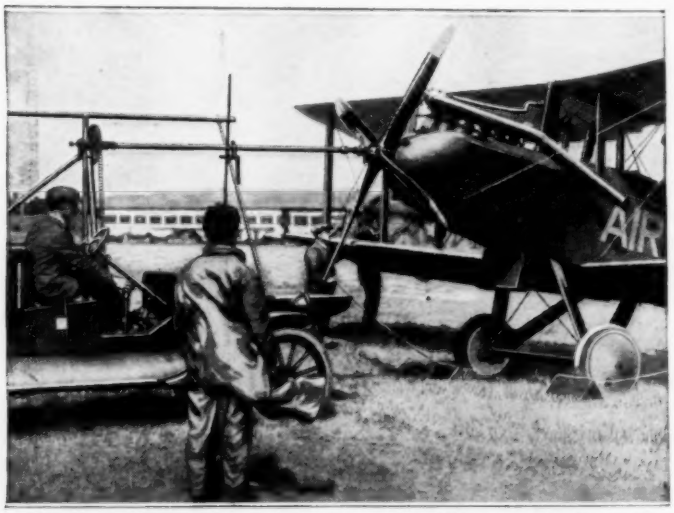
While the Hungry Guests Eagerly Awaited Their Meal, a Burlesque Labor Strike was Staged by the Volunteer Waiters, Who are Shown Here Dramatically Voting in Favor of a Walkout



Western Hospitality Extended to a Party of More Than 200 Easterners on the Pacific Coast: Breakfast was Served on a Table 300 Feet Long, Built beside a Winding Mountain Stream, by 50 Business and Professional Men from a Near-By City. Trout and Bear Meat Were the Principal Dishes

PORTABLE AIRPLANE STARTER SAVES LABOR AT AIRDROMES

In view of the search being conducted by our own army air service for a satisfactory airplane cranker to be used about its flying fields, attention is drawn to a British mechanism of the kind. A horizontal shaft at the height of the propeller hub is mounted on an automobile chassis and revolved by a chain and sprocket from the engine. At the working end of the shaft is a universal joint and socket by which the connection with the propeller is made. On its automobile mounting the apparatus may be rushed quickly to any part of the flying field.



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This Auto-Mounted Airplane Starter is Finding Favor in England as a Substitute for the Dangerous Method of the Past, Responsible for the Mutilation and Death of So Many Mechanics

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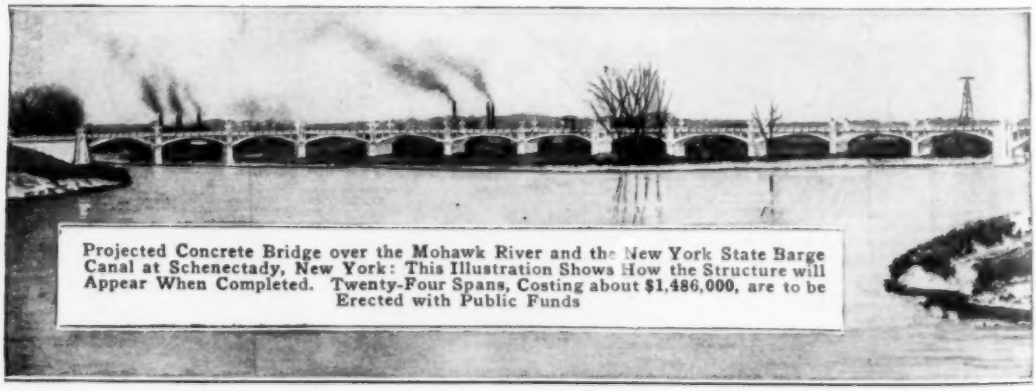
¶Bags of aerial mail dropped at Sacramento, Calif., will be caught in a large net installed on the Federal-building roof.

COLLECTIVE-OWNERSHIP PLAN FOR FLAT BUILDINGS

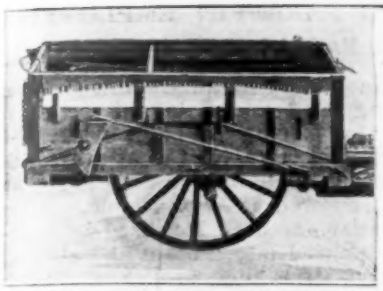
Six modern apartment buildings, located in an exclusive suburb of New York City, are jointly owned by the tenants of the 60 suites in the structures, who manage them coöperatively. The collective-ownership plan was suggested in newspaper advertisements by the corporation that erected the buildings, shortly after their completion recently, and more than 1,000 letters of inquiry were received as a result. Out of this number of interested persons, a list of desirable purchasers was selected. About half of those who bought were living in the buildings at the time the sales were made. Many prominent residents of the metropolis became owners of suites. Plans have been made and funds provided for the erection of other high-class apartment buildings in the same locality, to be operated by the occupants.

PLAN LONG CONCRETE BRIDGE OVER MOHAWK RIVER

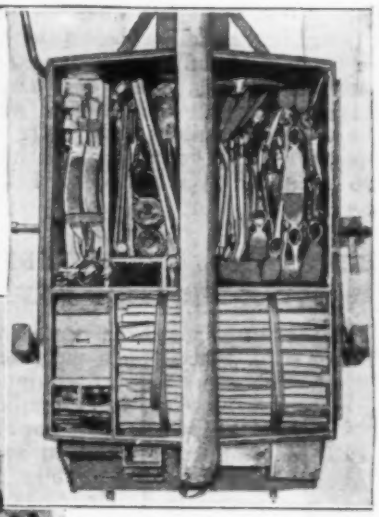
Work on one of the longest concrete bridges in the world will begin soon at Schenectady, N. Y., where a beautiful structure of this type is to be built across the Mohawk River and the New York State Barge Canal. According to the plans, the bridge will be 4,436 ft. long, and will comprise 24 spans, ranging in

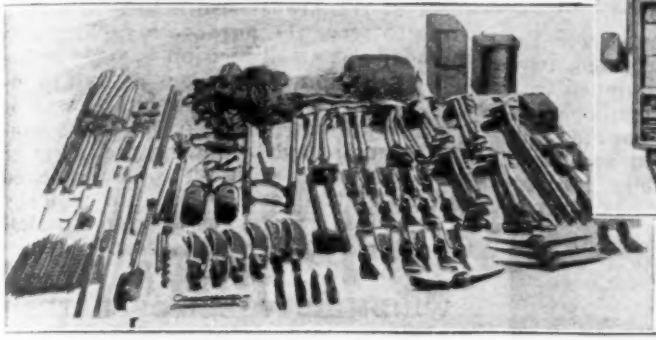


Projected Concrete Bridge over the Mohawk River and the New York State Barge Canal at Schenectady, New York: This Illustration Shows How the Structure will Appear When Completed. Twenty-Four Spans, Costing about $1,486,000, are to be Erected with Public Funds



That the Tool Wagon Is an Extremely Substantial Affair may be Gathered from the Side View at the Left, in Which the Heavy Iron Reinforcements are Visible. Below, the Contents of the Vehicle are Seen Spread Out, from Which Its Capacity may be Realized



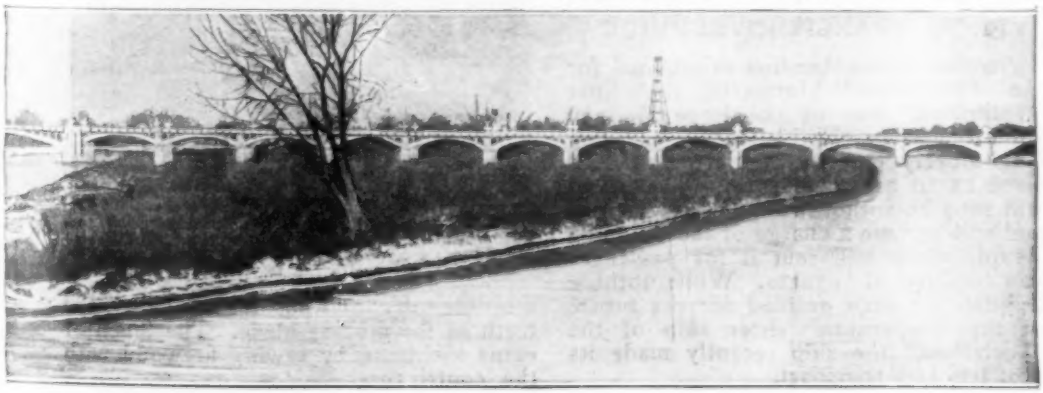


The Top View, Above, Gives the Best Idea of the Wagon's Ability to Carry Tools, and Also Shows the Waterproof Canvas Cover, Rolled Up

length from 106 ft. to 212 ft. There will be a 40-ft. roadway, flanked by sidewalks, 6 ft. wide, on top of the arches, while a 100-ft. parkway, 300 ft. long, will lead up to the abutment on the Schenectady side. Street-car tracks will be laid in the center of the roadway. Public funds will be used to erect the great spans, which will cost, it is estimated, about $1,486,000. The approaches and abutments alone will mean an outlay of $200,000. Separate contracts will be let for different phases of the work, which is expected to be completed in 1921. The projected bridge will serve instead of an ancient steel toll bridge, now standing, which is crossed by approximately 150,000 pedestrians and 9,000 automobiles each week.

CAISSONLIKE TOOL CHEST HOLDS MANY SUPPLIES

War created many ingenious devices, developed in the time of stress to aid the fighting men on the battle field, but capable of adaptation to the needs of peaceful industrial armies. One of these is a mobile tool chest, resembling a field-artillery caisson, in which are packed implements and supplies in great variety and quantity. It is recommended for building contractors, lumbermen, road builders, and others who require a compact, easily moved tool carrier. The body of the conveyance is of wood, reinforced with wrought iron, a d divided into compartments. Two sturdy wheels carry the



load. A heavy canvas cover is provided. Among the articles packed in the box are shovels of different sizes, axes, picks, mattocks, mallets, sledge hammers, pliers, wrenches, extra handles for axes and picks, ropes, pulleys, and wire, besides many others. The cart can be hauled by two men, or attached behind a wagon or truck.

RIVET HOLES COUNTERSUNK WITH ELECTRIC DRILL

Another use has been found for the electric drill. Placed on a weighted, two-wheeled cart, equipped with handles, it is employed in shipyards for countersinking rivet holes in steel hull plates. This mobile contrivance was developed as a result

Using a Special Portable Electric Drill in a Shipyard for Countersinking Rivet Holes in Steel Hull Plates

of the discovery that protruding rivet heads reduce the speed of boats and gather floating vegetation. A special bit is used, this being designed to cut depressions around the edges of rivet holes up to 1 in. in diameter. Only seven seconds are required to countersink a ⅞-in. hole, it is declared.

MAMMOTH VESSEL WITHDRAWN FROM TRANSPORT SERVICE

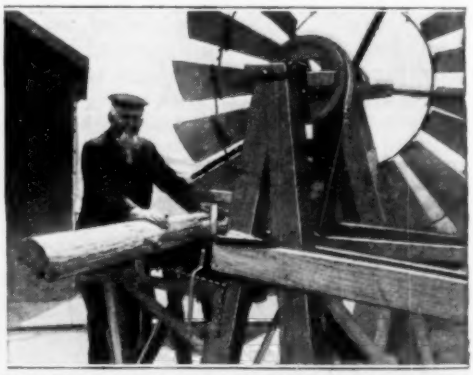
Another transformation is planned for the "Leviathan," formerly the liner "Vaterland," one of the large German ships seized by the United States when this country entered the war, and used since as an army transport. The vessel will soon be withdrawn from this service, and will become a charge of the Shipping Board, which will refit it for passenger and commercial voyages. While nothing definite has been decided for the future of the "Imperator," sister ship of the "Leviathan," the ship recently made its final trip as a transport.

SOLID PARAFFIN EMPLOYED IN FACIAL OPERATIONS

Paraffin is used by an English surgeon for filling depressions in the faces of patients by placing the wax under the skin in a solid state, instead of melted, as has been done generally in the past. The method followed is very simple. After the material has been sterilized by heating, it is poured into a basin and allowed to solidify. It is then broken up, and a piece of the proper size is shaped with a knife to serve the purpose for which it is intended. A small incision is made in the skin at the point where it is desired to insert the paraffin, and the bit of wax is pushed through the opening. The operation is completed by sewing the edges of the cut together with fine catgut. Melted paraffin, introduced under the skin by means of a syringe, has proved unsatisfactory in a number of respects.

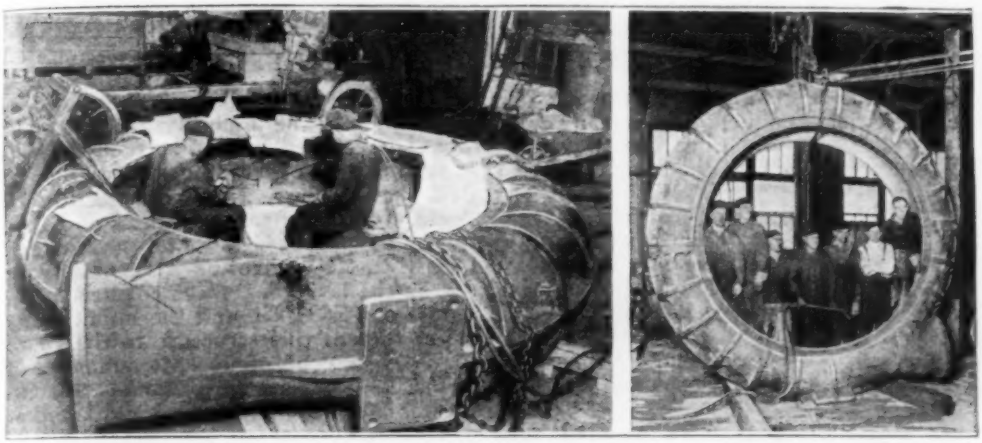
WINDMILL WHEEL OPERATES MAKESHIFT WOOD SAW

Crude in appearance, but efficient in operation, a makeshift power wood saw assembled by an aged Californian is driven by air currents. The wheel of a windmill is mounted on a frame of timbers in such a manner that, when it is turned by a breeze, power is transmitted through a belt to a mechanism which operates a form of jig saw, the vertical blade of which was taken from an ordinary buck-saw. Wood is cut by placing it on a



Wind-Operated Wood Saw: When the Windmill Whee. Turns, the Blade is Given a Reciprocating Motion. The Inventor Earns His Living by Sawing Firewood with the Device

movable table, and pushing it against the teeth of the moving blade. The inventor earns his living by sawing firewood with the contrivance.



Relining the Circular Chamber of a 14-Foot Centrifugal Pump by the Acetylene-Torch Process: In the Left Picture the Men are Seen Welding the New Steel into the Worn Casing, with Aid of Oxyacetylene Blowpipes, and the Right View Shows the Job Finished and the Chamber, "Better than New," Ready for Work Again at One-Third the Cost of a New Casting

HUGE PUMP RELINED BY OXYACETYLENE PROCESS

The great centrifugal pumps, or "sand-suckers," used for dredging silt, sand, mud, and gravel from river and harbor bottoms, are subject to excessive wear from the constant friction of abrasive particles against the inner walls of the pump chambers. To replace one of the worn-out castings commonly requires 10 to 12 weeks, during which dredge and crew grow rusty in idleness. By the use of the oxyacetylene weld, however, it has been found possible to rebuild one of the huge chambers in less than a week, and at one-third the cost of a new casting. The demonstration was made with a chamber measuring 14 ft. in outside diameter, and weighing seven tons. Working in relays, two men at a time, the inner surface was rapidly built up to its old dimensions by the addition of a toughened steel. As the added metal varied between one and a half and two and a half inches in thickness, 1,264 lb., or more than half a ton, were needed to complete the rebuilding. It is believed that the repaired pump is more serviceable than the original.

BEES FOLLOW FLOWER-LADEN AIRPLANE

The Flower-Laden Airplane, on Its Way to a Flier's Funeral, was Followed by a Huge Swarm of Bees

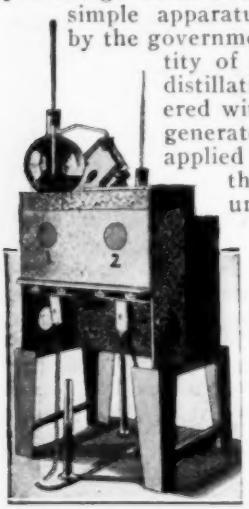
The owner of a large apiary in southeastern Missouri is mourning the loss of half his million bees, lured from home by a passing airplane. The plane was on its way to the funeral of a former lieutenant of the air service, the after cockpit heaped with fragrant magnolia blossoms and trailing a magnificent wreath. Passing over the bee farm, the alluring odor was wafted to the hives. The bees swarmed at once, and were last seen as a large cloud dwindling into the far west after the fleeing airplane. The strange chase continued for at least 20 miles.

HONOR MARINE-CORPS DRUM WITH WOUND STRIPE

Glory was not won by men alone on the battle fields of the world war. To illustrate, there is the bass drum which returned from France recently with a regiment of the Marine Corps, decorated with a wound stripe and four service chevrons. These marks of honor were painted on one head of the instrument, along with the insigne of the corps and that of the division to which the regiment was attached. The wound stripe was considered appropriate after the drum had been damaged by a bursting shell.

SIMPLE MACHINE MEASURES MOISTURE IN GRAIN

Grain inspectors determine the exact percentage of moisture in samples by a simple apparatus recently adopted by the government. A certain quantity of grain is placed in a distillation flask and covered with mineral oil. Heat generated by electricity is applied to the flask, with the result that moisture is driven from the grain in the form of vapor, which is condensed in a tube leading to a glass container, graduated to indicate moisture percentages. A test requires from 25 to 30 minutes. Six compartment machines are used in the larger mills, elevators, and laboratories.



¶A new airplane record of 2 hr. 15 min. from Turin, Italy, to Rome, a distance of 362 miles, was recently established by a biplane with a 700-hp., 12-cylinder engine.

MUNICIPALITY OFFERS PIERS TO SHIPPING BOARD

Piers to accommodate the 1,000-ft. steamships to be built by the Shipping Board have been offered to that body by the authorities of New York City, who are desirous of preventing the erection of docks for the vessels at Fort Pond Bay, L. I., as proposed by the government. One of the piers mentioned as suitable for use by the large boats was constructed at a cost of $5,500,000, and the municipality offers to rent this structure to the board for 7½ per cent of its cost annually, or $412,500. The city government also expresses its willingness to build another pier of similar size alongside the one now standing, if it is considered necessary.

METAL TIRE CASE DESIGNED FOR SMALL AUTOMOBILE

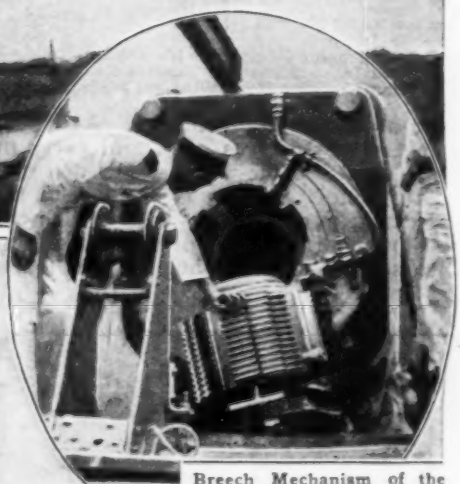
Protection from thieves and the elements is given by a metal tire case that was placed on the market not long ago. It is designed to be affixed at the rear of a certain type of small car. The accessory is shaped like a casing, and is of such size that a tire for the machine for which the case is intended fits perfectly inside. A special bracket is supplied for attaching the device to the car. It can be fastened with a padlock provided for that purpose.

"AIRSHIP" AND "AIRPLANE" OFFICIALLY DEFINED

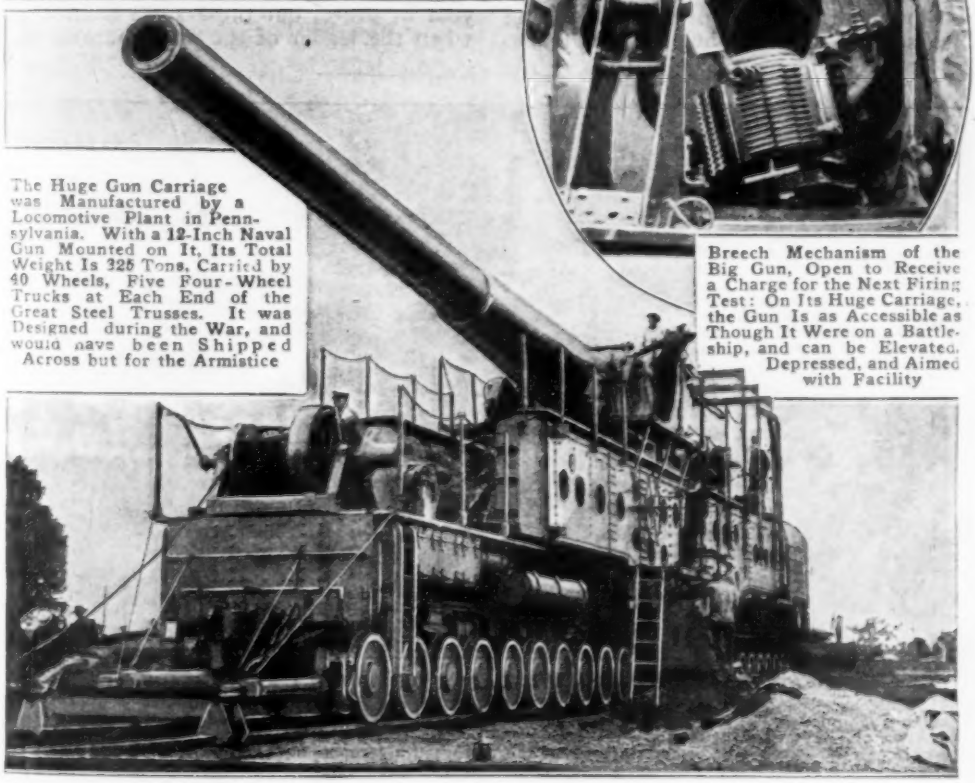
Hereafter the word "airship" may not properly be applied to any kind of plane, but will designate only the class of flying craft that are lighter than air, such as dirigible balloons and other forms of aerial gas bags. The term "airplane" will mean any flying machine that is heavier than air, and is lifted by the power of its motors. The U. S. Air Service has made these definitions official, with the purpose of putting an end to the rapidly growing confusion in the nomenclature of the aerial profession. This distinction has been consistently followed by Popular Mechanics Magazine for several years past.

GIANT RAILWAY GUN CARRIAGE IN SERVICE TEST

New Railway Gun Carriage of Enormous Size in Recent Service Tests at the United States Naval Proving Grounds at Dahlgren, Virginia, 60 Miles South of Washington: The Carriage Mounts a 12-Inch Naval Gun, with a Range of 35 Miles, and the Recoil of the Discharge When This Picture was Taken Was Seven Feet



Breech Mechanism of the Big Gun, Open to Receive a Charge for the Next Firing Test: On Its Huge Carriage, the Gun Is as Accessible as Though It Were on a Battleship, and can be Elevated, Depressed, and Aimed with Facility



The Huge Gun Carriage was Manufactured by a Locomotive Plant in Pennsylvania. With a 12-Inch Naval Gun Mounted on It, Its Total Weight Is 325 Tons, Carried by 40 Wheels, Five Four-Wheel Trucks at Each End of the Great Steel Trusses. It was Designed during the War, and would have been Shipped Across but for the Armistice

PHOTOS COPYRIGHT, LEDGER PHOTO SERVICE

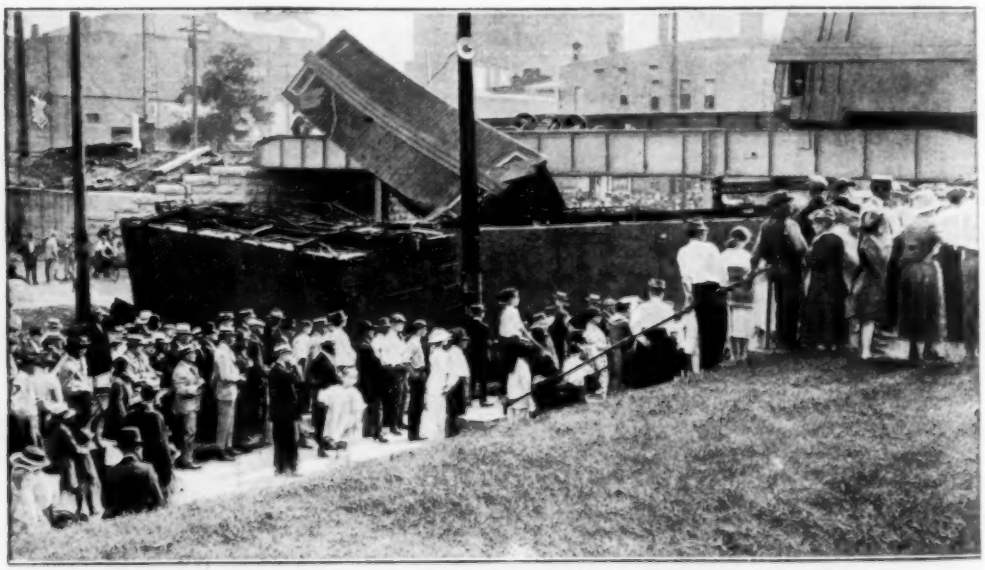
SMALL INDUSTRIAL TRACTOR ACTS ALSO AS TRUCK

Industrial tractors, for hauling purposes around warehouses and yards, are coming into almost as extensive use as their agricultural prototypes. As a rule they are locomotives only, and carry no load. A new three-wheel model designed by an Illinois concern is peculiar in the possession of a capacious body, which can be dumped with a hand winch, enabling it to serve as a small but efficient truck.

Industrial Tractor Equipped with a Small Truck Body, Enabling It to be Used Independently of Trailers for Carting Work: The Body is Dumped with a Hand Windlass Whose Cable Runs over a Mast

ARCTIC EXPLORERS ON FLOE FOR FIVE MONTHS

Scientific data of considerable value were obtained by a party of 15 men who returned to civilization recently after spending about five months on a drifitng ice floe in the Arctic Ocean. Special attention was given to the study of currents in Beaufort Sea, that part of the ocean which stretches north of Alaska and Canada as far as Banks Land, and numerous soundings were made in the cold waters. It is the opinion of the explorers that land exists farther north than the point reached by them, latitude 74° north. The floe on which the strange voyage was made was seven miles wide and 15 miles long. Many seals, polar bears, ducks, and land birds made their homes on the floating block of ice. Plans had been made for remaining on the floe for a year or more, but these were abandoned when the leader of the party became ill.

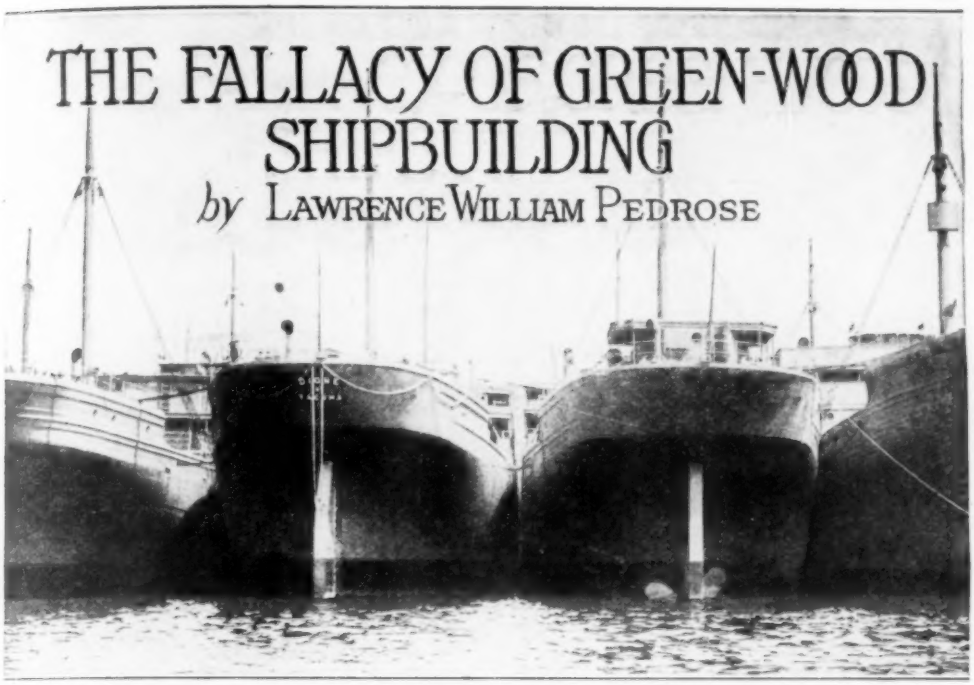


STREET TRAFFIC SPARED AS FREIGHT CARS VAULT FROM BRIDGE

THIS railroad smash-up at Springfield, Ill., was unusual both in itself and in the number of hairbreadth escapes it involved. The cause of the mishap is undetermined; but it is believed that a dragging brake beam lifted one of the freight cars several feet off the track, whence it fell sidewise, with two others, into the street below. There is no uncertainty about the hairbreadth escapes, however, as the plunging cars were seen to miss by a few feet a pedestrian, a motorcyclist, an automobile, and a street car. No one was injured.

THE FALLACY OF GREEN-WOOD SHIPBUILDING

by LAWRENCE WILLIAM PEDROSE



Of the Ships Shown Here, the Three to the Right Are the "Dione," the "Electra," and the "Cineas." They Are Part of a Long Row Anchored in Lake Union, Seattle. None of the Photographs Used with This Article have been Retouched

MAGAZINE HAS WILD TALE: In the July issue of Popular Mechanics is printed the startling assertion that lying idle on the Pacific coast is a fleet of more than 50 wooden steamers that will remain idle until they fall apart, because of green timber used in their construction that unfits them for service.

Builders along the Pacific coast are asking each other in what particular secreted "snug harbor" has Uncle Sam hidden these specimens from the gaze of his people? Certainly they are not in the Columbia River, Grays Harbor on Puget Sound, or in California ports.

In connection with the statement is published a cut showing 11 vessels moored in a row, with bows pointing toward the camera, beneath which is the caption:

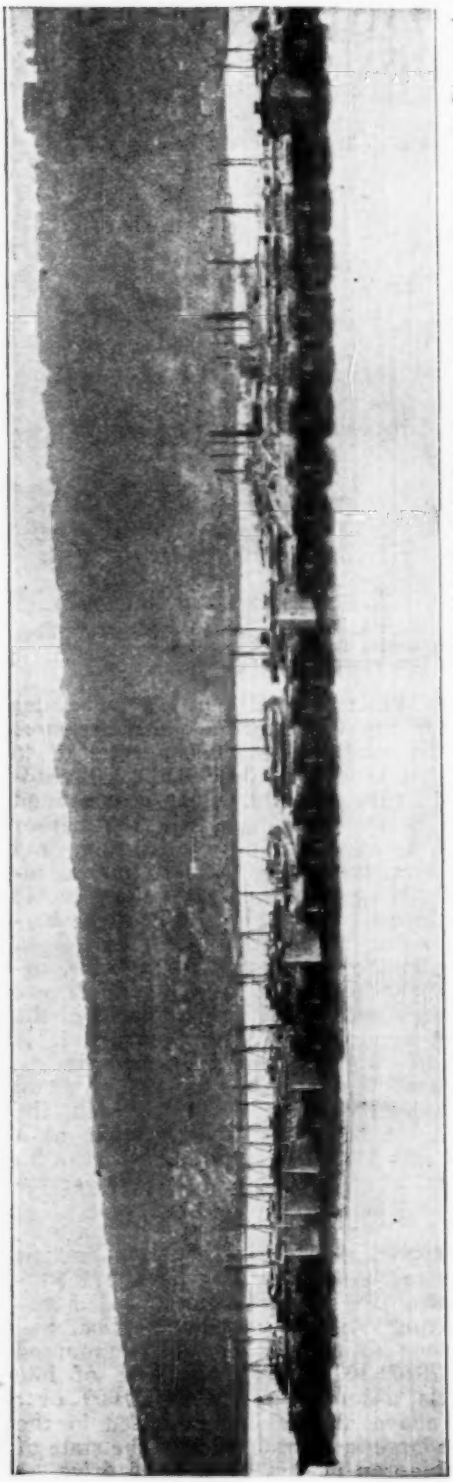
"These 3,500 and 4,000-ton wooden ships of the Emergency Fleet Corporation are part of the 50 which lie idle in the harbors of the Pacific coast. The green timbers used in their construction are said to have shrunk on their maiden voyages, making them totally unseaworthy."

Of the 11 pictured, only four are shown to have smokestacks or funnels, so they might have made voyages, but the others are hulls only, and it is not recited how they managed to propel themselves.

At the rate the shipping board has been selling the wood vessels, also their proven desirability for carrying lumber and ties from the Pacific to the Atlantic and Europe, while there are none of the steamers remaining at the yards which are not actually being finished for sea, the publication in question is causing a stir. While recognizing the harmful effect on the wood-ship industry, builders say the wood fleet has proved its stability so thoroughly that men interested in that class of construction know how far from the truth the Popular Mechanics story is.—The Morning Oregonian, Portland, Ore., June 25, 1919.

IN Lake Union, in the heart of Seattle, lie 44 wooden steamships, property of the Emergency Fleet Corporation's wood-ship division. In the East Waterway of Seattle's salt-water harbor are two more wooden steamers on the mud flats. Thus, a total of 46 wooden vessels of 3,500 to 4,000 dead-weight tons capacity, which cost around $200 a ton to build, lie in the harbor reaches of Seattle, representing, say mariners, nearly the total of the wood-shipbuilding program of the Pacific Northwest. These ships are on the bargain counter. Most of them have been lying in the "boneyard" for months, despite the fact that cargo carriers are scarce, which fact is an indictment of the green-wood shipbuilding program, it is said. Being built of unseasoned timber, green as the trees it was cut from and generally stored in water till used, the inevitable result was that as soon as a ship was launched its timbers began to shrink, its calking loosened, and it became unseaworthy.

These forty-six vessels represent a total of approximately 162,000 dead-weight tons, and a building cost of about $32,400,000. The subscriptions of the manufacturing cities of Seattle, Tacoma, and Spokane to the Victory loan amounted to $28,671,100. Thus, the fleet of idle vessels absorbed nearly $4,000,000 over and above all the money raised in the three large industrial cities of the state of Washington in that great bond drive.



This Shows the Wooden Ships Anchored in Lake Union, Seattle's Inland Harbor. There Are 44 of Them in This Group. Their Open Seams may be Discerned at a Distance, and Paint Remains Only Here and There

Identity of the Ships

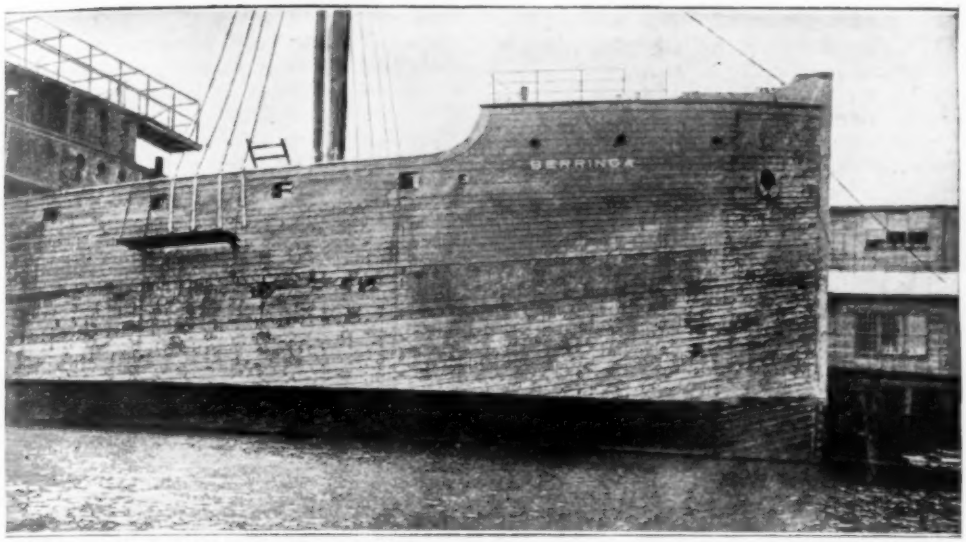
The idle wooden ships in Lake Union are the steamers "Fort Jackson," "Allenhurst," "Boulton," "Boughton," "Bowesmont," "Bourneville," "Addison," "Ahmik," "Cineas," "Fort Union," "Chesterfield," "Puyallup," "Capraria," "Abilla," "Elestra," "Azalea," "Adria," "Abydos," "Oelwin," "Arcademia," "Academia," "Pezuta," "Black Wolf," "Birkland," "Agylla," "Bastine," "Blanford," "Agron," "Anthon," "Bertrand," "Bingamon," "Cabacan," "Cardia," "Cineyras," "Cozian," "Dione," "Elissa," "Endymion," "Fort Harrison," "Fort Stanwix," "Imukfa," "Kitan," "Looti," and the barge "Corus."

The two wooden steamers in the East Waterway are the "Babinda" and the "Berringa." From the last two the machinery was salvaged to keep them from sinking, and at present they are resting on the tide flat so they cannot sink. Their paint has peeled off from stem to stern and from keel to bulwarks. Their scabby appearance makes them an eyesore at a distance of several hundred yards; their open seams can be detected as far away, and the loose calking hangs in shreds from the gaping planks. These steamers show greater decrepitude because they have made an ocean voyage.

The 46 ships moored in Seattle's harbor represent part of the price the American people paid for having their war program in incompetent hands, say observers. The Emergency Fleet Corporation, despite reckless expenditures aggregating millions on the wood-shipbuilding program, acted honestly, but with a blind faith which led it into a pitiable failure in this branch of its endeavor.

Fallacy of Green-Timber Construction

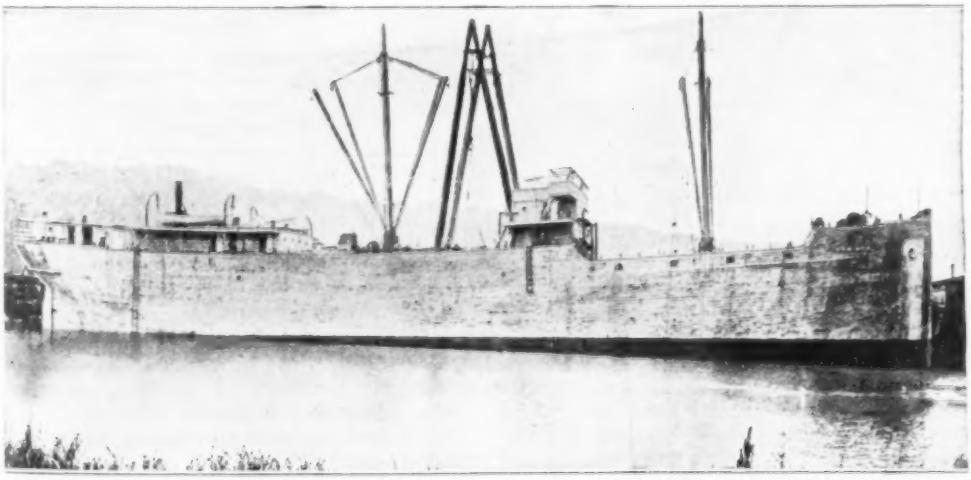
Builders from the great British shipyards on the Clyde and from the famous yards of New England tell how timber is prepared for shipbuilding. Months, perhaps even a year or two, are spent in carefully curing every stick of wood before it is slung up on the shipways and made a part of a vessel. A ship constructor who is a conscientious builder, they say, would no more think of putting a green plank or beam in a ship than he would of condemning his sailor brother to make an ocean voyage in a cheesebox. But on the Pacific coast fir logs were towed to the mills in booms, taken up on the conveyors, roughly cut, and immediately dumped back into the water to be towed to the shipyards. There also, to



Close-Up of the Bow of the "Berringa" Taken from a Sandspit: The Gaping Seams of the Ship Are Plainly Visible, and from Them the Calking Hangs in Shreds. The Picture Also Illustrates the Action of the Green Timbers on the Paint, Which has Scaled Off from Stem to Stern and from Keel to Bulwarks

facilitate storage, the timbers were generally kept in booms in the water until picked up by the gantry cranes and slapped into place on the building ways. In a few weeks the hull of a ship was ready for launching. It was inspected—for knotholes—slipped into the water, and the builder credited with another ship.

It was a smooth chain; the millman sold his best logs at a price he never before dreamed of, and could pay his crew good wages; the shipbuilder put on an army of extra workmen to rush the job, slapped the ship together, launched it, and with the credit allowed could pay his carpenters high wages and allow bonuses to every official, superintendent, foreman, and underforeman. Everything went serenely. Ships and more ships was the cry, and, about the time the armistice was signed, enough of these green wooden steamers had been launched and fitted out with machinery to put the wood-shipbuilding program to the real test of service. Then came the cruel awakening.



The "Babinda," Companion Hulk of the "Berringa," and a Wooden Steamer Which Suffered the Same Fate: Both These Ships, It is Understood, were Purchased by the Australian Government. The Derrick Used to Hoist the "Babinda's" Engines and Boilers Is Still in Place. The Condition of Her Timber and Seams, It can be Seen Even at a Distance, Is the Same as That of the "Berringa," and Her Paint Also has Scaled Off

The Program "Blows Up"

With flags flying and whistles tooting, the first few completed wooden steamers headed for the Atlantic via the Panama Canal. Somewhere off the coast of Oregon or northern California one of them evidently opened too many seams at once and entered the port of missing ships. Nothing has been heard of it or its crew since the day it sailed out of Puget Sound. One wooden steamer, it is stated, put in to San Francisco with its timbers so badly shrunk that the crew declared they could stand in the hold and see the city through the gaping seams.

Some of the wooden steamers reached France. There, it is said, as much money was spent to put them in shape again to go back to sea as it cost to build them originally.

The steel-shipbuilding program was going ahead under a full head of steam. The steel steamers met their tests and went into service without a hitch, as did the wooden steamers, but the steel vessels made voyage after voyage, circled the globe and returned again and again to America for cargoes. Today the steel ships, shipping records show, are giving close to 100-per-cent service. The wooden steamers, on the other hand, are, with but few exceptions, lying idle near the place where they were constructed. Being built of green timber, say mariners, they are not seaworthy; being unseaworthy, insurance cannot be obtained on them; without insurance to protect the shippers, none will charter them.

When the crash came, builders of wooden steamers saw their market collapse and sought to "get out from under." A suggestion was even made that hulls on the ways be paid for to the extent that they were completed, and then dynamited. Finally it was thought better to complete the shells and slip them from the ways so they could be towed to some safe harbor, while prayerful supplications were sent up that somebody would buy them—if only for barges.

The building of unseaworthy ships, however, was by no means confined to the West. The Atlantic coast can also furnish its examples.

THUMB PRINT PROTECTS AUTO FROM THIEVES

Professional automobile thieves may cease to reap their regular harvest and find real cause for worry in a system for protecting and recovering cars by means of thumb prints,

Thumb Prints for Protecting Automobiles: By Comparing the Print on a Car's Instrument Board with Those on Cards Filed with the Police and Carried by Drivers, the Ownership of a Machine can be Established, as a Description of the Owner is Written on the Cards

one of which is placed on the instrument board of the machine by a process that prevents its removal without noticeable defacement of the board. A card bearing a duplicate of the thumb mark is carried by the owner of the car, while other cards of a similar nature are placed on file with the police.

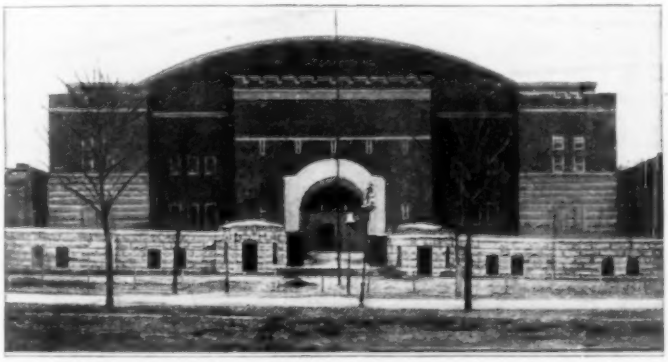
HIGHWAY-TRANSPORT COURSE INCLUDES MANY SUBJECTS

College courses in highway-transport engineering, a profession that is growing out of the increased use of the motor truck, must include a large number of diversified subjects, and give the graduate a much more comprehensive knowledge than is given by many technical courses, declares an eastern university professor. Economics, political economy, social science, business and contract law, scientific management, business organization, cost accounting, interstate commerce, and marketing and distributing systems should be included in the course as basic subjects, according to this authority. Other subjects to be studied include highway-traffic legislation; highway-transportation methods; highway engineering as it affects economic highway transport; the mechanism of the motor truck, motor bus, tractor, and trailer, and their operation, inspection, maintenance, repairs, and cost data. With such preparation, every phase of road traffic could be handled.

REMODEL ARMORY WEAKENED BY SETTLEMENT

Strongly reinforced concrete floors held together the walls of a big armory in a Middle West city for years after the structure was weakened by settlement, but recently it was found expedient to remove a considerable portion of the building from its sinking foundation and to brace the remainder to make it safe for occupancy. Before this scheme was carried out, several plans for restoring the armory were considered and a few tested. One attempt was made to level the structure with jacks, but it was a failure. The front of the original building was three stories high and of stone construction. Back of this was a drill hall, the roof of which was supported by six arched steel trusses. On one side of these structures was a rifle range, and on the other a riding hall, both one story in height.

The Original Armory: Indicated by the Arrow, Is the Line above Which the Stone was Removed to Make the Building Safe. Reinforced-Concrete Floors Held the Walls Together for Years



View of the Remodeled Structure: The Wall in the Foreground, Formerly the Base of the Main Building, Shows How the Latter Settled at Its Right End. Back of the Wall Is the Front of the Drill Hall

In carrying out the latest project, the second and third stories of the main building were taken off, leaving the base standing as a stone wall some distance in front of the drill hall. The ground floor was left, as it binds together the entire structure, and the front wall of the drill hall, then exposed, was improved in appearance with stucco and other material. Four longitudinal struts were placed in the roof of the drill hall, connecting the trusses, while diagonal braces were installed between the steel columns supporting the latter. As they had settled only a little, the rifle range and riding hall were not altered.

Investigation of the site on which the armory was built disclosed that the subsoil is soft mud for 41 ft. below the surface at many points. Piles driven to provide a foundation for the building were not long enough to reach a solid stratum of earth. Settlement of the structure began while it was being erected, and continued until the heavy upper portion of the main building was removed. At certain points it sank over 2 ft. Engineers differ on the question of whether the armory in its present condition is safe.

DEVICE PREVENTS OXIDATION OF MOLTEN ALLOYS

Oxidation of molten alloys, and consequent loss of material, is prevented by a simple device recently patented in Germany, it is declared by the inventor. An air-tight container is provided for holding the combined metals while heat is applied, and to this is attached a pipe which connects with a cylinder filled with compressed nitrogen. The introduction of this inert gas into the melting pot prevents oxidation. A valve is provided to control the flow of nitrogen.

PRESENT CHAMPION AIRMAN WITH VALUABLE JEWELRY

Exquisite tokens of gratitude and admiration were presented recently by two west-coast cities to the American airman

These Creations of Platinum and Diamonds were Presented by Two West-Coast Cities to America's Champion War Flier

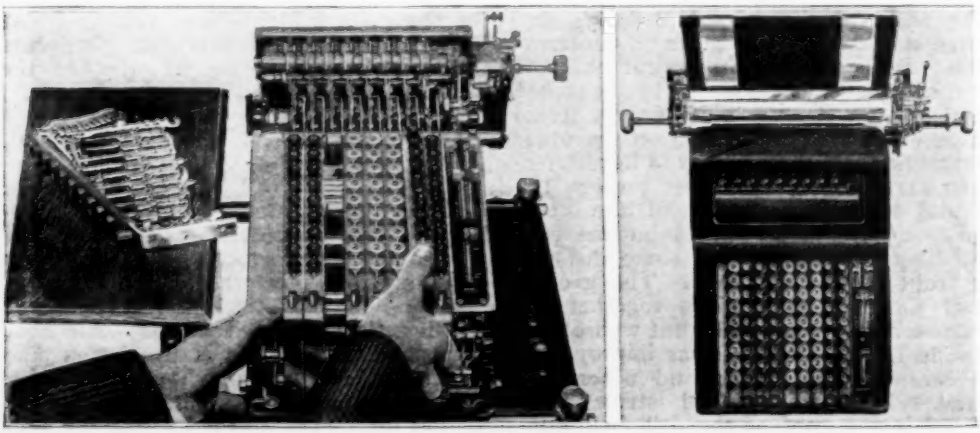
whose war victories outnumbered those of any other member of the air service. One is a scarf pin of platinum, bearing a miniature biplane, which is studded with 48 diamonds, representing the states of the union. This is valued at $1,000, and was given to the flier at a banquet arranged in his honor. Another city bestowed on the hero a platinum ring, set with a one-carat, diamond-shaped diamond. The stone is surrounded by enameled representations of the four aces in a deck of playing cards. On one side of the setting is the insigne of the air service, while on the other is the seal of the municipality which gave the ring. Encircling the band are 26 stars, in relief, representing the recipient's victories. Both pieces of jewelry were designed and made in the cities presenting them.

ELECTRICAL PRECIPITATION SAVES LOST SILVER

A concern engaged in melting silver saved $30,000 worth of metal in one year by installing an electrical precipitation plant costing $25,000. The amount of vaporized metal collected corresponded exactly with the advance calculations, made by the use of available tables on the so-called vapor tension of metallic silver. It was found that a considerable quantity of the silver was vaporized even at temperatures lower than the melting point, where an open flame was in contact with the metal. The quantity increases, of course, as the temperature rises.

ADDING MACHINE SUBTRACTS AND MAY BE TAKEN APART

At least two novel features are embodied in the construction of an adding machine just placed on the market by an Iowa concern. Most remarkable, perhaps, is the facility and safety with which it may be taken apart, in spite of its complex nature, a pair of pliers and a penknife being the only tools necessary. The sectional-unit construction of the keyboard makes it possible, by withdrawing a rod, to remove a defective row of characters, substitute temporarily one taken from a less used part of the machine, and continue the work in hand. The adding wheels are removable in like manner. The operation of greatest value, however, is the machine's ability to subtract as easily as it adds. This is made possible by a simple reversing lever, which causes the adding wheels to run backward.

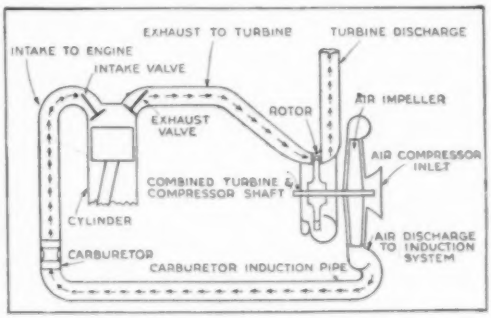


The Manner in Which the New Adding Machine is Taken Apart, and Its Sectional-Unit Construction, are Plainly Seen at the Left. The Assembled Machine is Seen at the Right, the "Subtract" Lever Being Visible at Its Lower Right-Hand Corner

Airplane with Supercharger Installed on Its Liberty Motor: It Feeds Air to the Carburetor at Constant Pressure Regardless of Altitude, the Speed of the Turbine Rotor and Air Compressor being Automatically Changed as the Height Changes. The Turbine's Maximum Speed Is 31,050 Revolutions a Minute

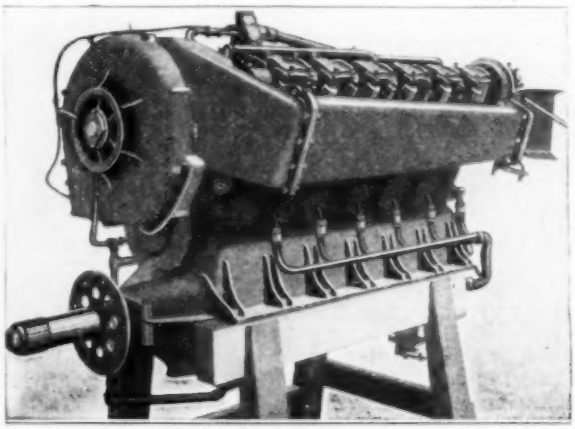
ENGINE SUPERCHARGER MADE RECORD FLIGHT POSSIBLE

FOR four or five years European aeronautical engineers have been experimenting with mechanisms which would maintain constant air pressure before the carburetors of air-craft engines regardless of altitude. They have known that the air-craft engine delivers at 20,000 ft. only 50 per cent of its ground-level power; they have searched, consequently, for a compact air compressor of small weight, which will maintain the normal power of an engine at all reasonable altitudes. The work in America, begun several years later, has heretofore been purely experimental; but with the recent performance of Major Shroeder's Le Pere biplane at Dayton, Ohio, the "supercharger," or auxiliary compressor, seems to have come to stay. The major climbed to 18,400 ft., and at that height, with the aid of a supercharger, was able to fly at the remarkable speed of 137 miles an hour.



The Diagram Shows the Course of the Air from the Compressor to the Carburetor, and of the Exhaust Gases from Cylinders to the Rotor of the Turbine

The plane was driven by a 12-cylinder Liberty motor equipped with a Moss supercharger. The Moss, like the Sherbondy apparatus, is an American adaptation of a French invention, which it closely resembles in general operation. The red-hot exhaust gases from all cylinders are piped through special manifolds to the nozzle box of a small turbine, which is delicately balanced to allow a maximum speed of 31,050 r.p.m., and is made of a special alloy to withstand the terrific heat. A small, automatic control mechanism adjusts the turbine speed as the airplane changes altitude. Mounted on the same shaft as the turbine, but separated from



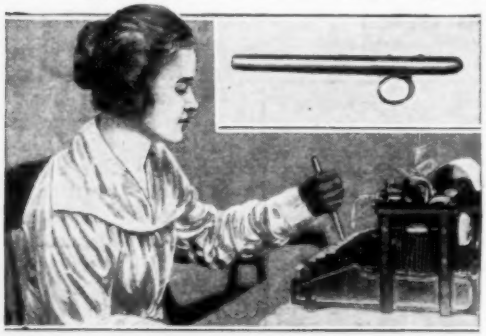
The Supercharger is Here Installed on the Front End of a 12-Cylinder Liberty Motor, the Turbine Nozzle Box Being Large to Avoid Restricting the Exhaust Gases

it by a cooling air or water space, revolves the centrifugal air compressor. From the compressor an air-tight induction pipe leads the air, now at approximately 15-lb. pressure, to the carburetor or carburetors. The whole apparatus is cleverly fitted into the smallest possible compass, permitting its installation at the front of the engine, just behind the propeller.

Such, in a general way, is the operation of the Rateau (French), Moss, and Sherbondy superchargers. Consuming only five to ten per cent of the engine's delivered horsepower, the supercharger adds 40 per cent at 15,000 ft. and 50 per cent at 20,000 ft. The gain in power is thus seen to be tremendous, easily compensating for increased weight (between 200 and 300 lb.) and complications of design and operation. Equipped with a supercharger, the fast plane of tomorrow will shoot along, four miles above the earth, at 200 miles an hour. Airplanes will travel faster at high altitudes, not slower, as at present.

HANDLESS TYPIST EMPLOYS SIMPLE CONTRIVANCE

Though both of her hands are missing, a young woman of St. Louis operates a typewriter with considerable speed



Handless Girl Operating Typewriter with Cushioned Stick Attached to Artificial Hand: The Device is Shown in the Insert

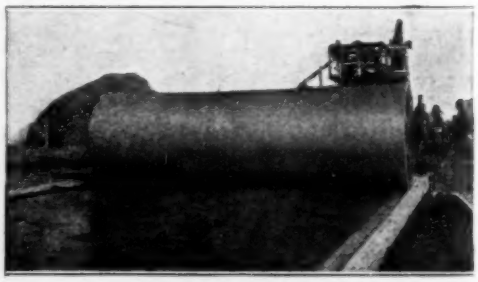
and dexterity. Following an accident four years ago, the victim's right arm was amputated just below the shoulder, while the left was taken off midway between the elbow and wrist. Since then she has worn papier-mâché arms and hands. The contrivance used for manipulating a typewriter is a round stick of wood, slightly over seven inches long, to which is attached a brass ring near one end and a rubber tip at the other. One of the fingers of the artificial left hand is passed through the ring when the device is employed, and the handless typist strikes the keys with the cushioned end.

UNLIMITED STREET-CAR RIDES FOR ONE DOLLAR A WEEK

A remarkable experiment in flat-rate street-car service is being tried in the city of Racine, Wis., having gone into operation on August 18. The system is the simplest possible. For one dollar the passenger buys a pass, good for one week, which gives him, and other members of his family, the privilege of unlimited riding. Conductors do not punch the cards, nor ask identification of the holder, and of course no transfers are needed. The week's cards expire at midnight on Sunday, each issue being distinguished by a different color. Obviously, the company hopes to raise the average transportation expenditure of its patrons by this bold means. Other public utilities with pronounced views on the unlimited-service question will watch the working of the plan with extreme interest.

CONCRETE-ROAD CONSTRUCTION FACILITATED BY HUGE ROLLER

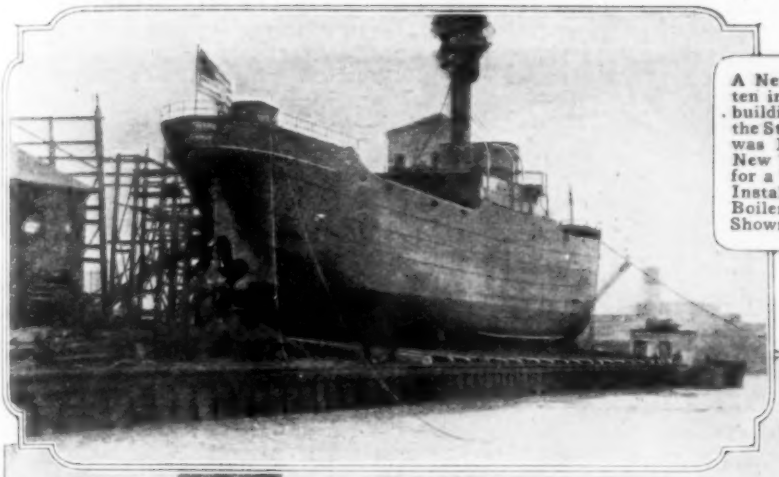
Apropos of the stress now laid on road construction as a factor in national prosperity, it is interesting to note the invention and use of a gigantic steel roller, weighing a ton alone, which extends from one side of the roadway to the other. Following close upon the mixer, the mass of steel is moved by two or three men back and forth over each 25-ft. section. Due to the weight and concave profile of the roller, this operation, repeated three or four times, is sufficient



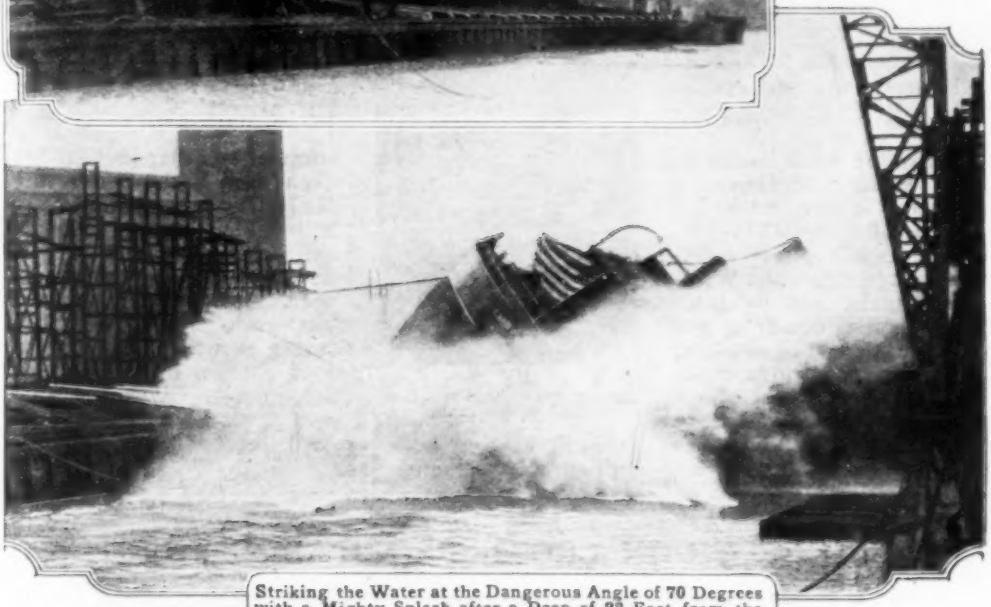
Rolled Back and Forth over the Newly Laid Concrete Roadway. This Huge Steel Roller Gives It Just the Desired Consistency and Convexity of Surface

to compress a 5-in. roadbed to the proper consistency, giving it at the same time exactly the desired convexity of surface.

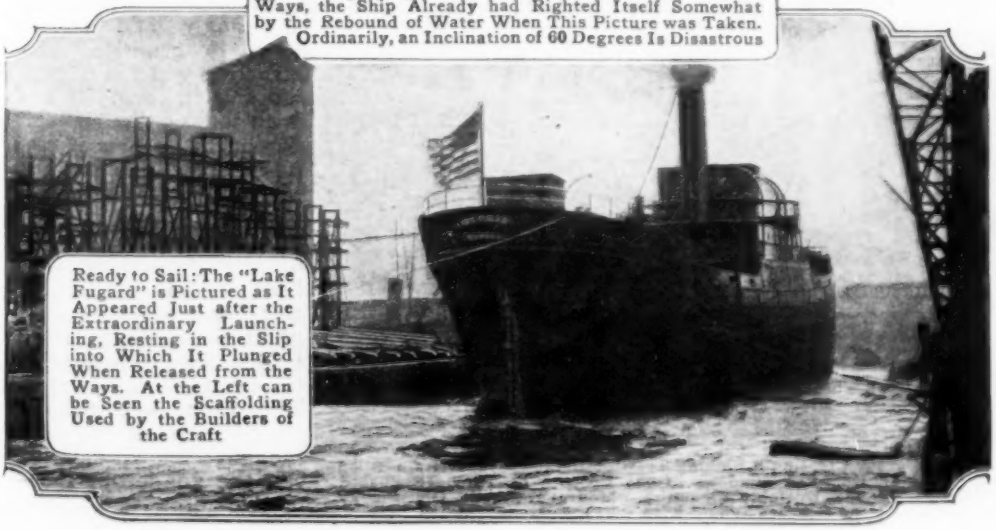
STEAMER SLIDES INTO WATER READY FOR VOYAGE



A New Chapter was Written in the History of Shipbuilding Recently When the Steamer "Lake Fugard" was Launched at Buffalo, New York, Fully Equipped for a Voyage, with Engines Installed, and Steam in the Boilers. The Vessel is Shown Here on Its Ways



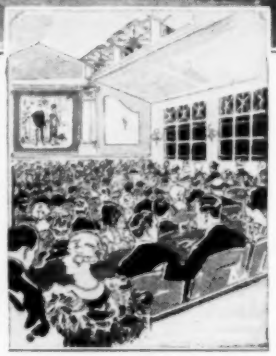
Striking the Water at the Dangerous Angle of 70 Degrees with a Mighty Splash after a Drop of 23 Feet from the Ways, the Ship Already had Righted Itself Somewhat by the Rebound of Water When This Picture was Taken. Ordinarily, an Inclination of 60 Degrees Is Disastrous



Ready to Sail: The "Lake Fugard" is Pictured as It Appeared Just after the Extraordinary Launching, Resting in the Slip into Which It Plunged When Released from the Ways. At the Left can be Seen the Scaffolding Used by the Builders of the Craft

GLASS-WALLED THEATER ON BUILDING ROOF

At Night the New Glass Theater, Building, Makes Quite a Spectacle Going and Its Transparent Walls



With the Big Glass Panes Swung Open, the House Is as Cool as Outdoors

Away Up on the Roof of a Seven-Story from the Street, with All Its Lights Glowing with the Radiance Within

A theater with walls of glass, seating a thousand spectators seven stories above the pavement, is Cincinnati's latest offering to entertainment. Wire-glass panels, set in huge steel frames, compose not only the sides but most of the roof of the curious structure, which will cost about $30,000. The seven-story building on which the new auditorium rests is itself a theater, and during fair summer weather its roof has been used without covering for such entertainment as suited the location. Now it will be possible to enjoy the outdoor effect the whole year. When it is hot, the big glass panels may be swung outward, and even the roof thrown open to admit the breezes. With this new roof garden, the whole theater building will seat a total of 3,100 persons.

PASSENGER TRAIN CROSSES UNSTABLE TRESTLE

Passengers on a railroad train in western Canada spent a few anxious minutes recently when the coaches passed slowly over a long wooden trestle, which sank alarmingly and threatened to crumble. The structure was 150 ft. high and 500 ft. long. It had been buried in an embankment to give it stability, but when the thrilling incident occurred, earth covered only the bottom halves of the supporting timbers, which rested on soft ground. At one point the surface of the bridge was depressed 2 ft. by the heavy cars. The train was pushed over the trestle, it being thought inadvisable to run the ponderous locomotive across.

Passenger Train Crossing a Sinking Trestle: Anxious Travelers can be Seen Looking from the Windows of the Coaches as They are Pushed Slowly across the Unstable Structure. Had the Trestle Given Way Completely the Coaches Would have Plunged Downward 150 Feet

PROPOSE AUSTRALIAN STONE AS DIAMOND SUBSTITUTE

Diamonds are rivaled in brilliance by white zircons found in great abundance in Australia and elsewhere and proposed recently by a French jeweler as cheap but satisfactory substitutes for the more precious stones which they so closely resemble. This is considered timely because of the growing cost and scarcity of genuine diamonds. Carefully cut, the sparkling crystals deceive even experts, who are forced to examine them closely before detecting their true character. Another beautiful zircon is known as the Australian hyacinth. It is a blood-red stone, resembling the ruby. Several years ago these stones sold at the mines in Australia for as low as $14 a carat. One reason given for the advance in the price of diamonds is that a large quantity of the stones have been hoarded by a syndicate of German bankers who are holding them to obtain a larger profit by their sale. The seizure of these diamonds is urged by jewelers in other countries.

By Using the Telephone Transmitter of the Automobile Radio Set as a Telegraphic Sender, Ranges Up to 40 Miles Are Possible with the Portable Antenna

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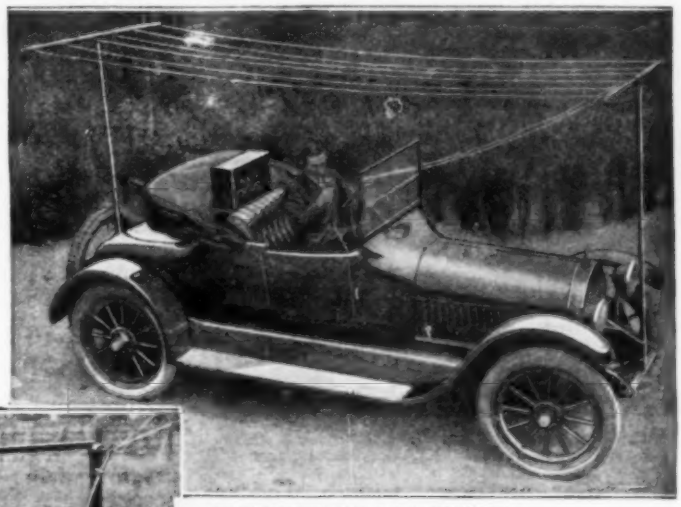
¶ Five automobile speeders were recently sentenced by a Chicago judge to a trip through the morgue and the county hospital, to gaze upon the victims of other speeders and report their impressions to the court later. This, the judge declares, is to be a regular procedure in the speeders' court hereafter. Effects upon the first offenders so punished appeared satisfactory.

RADIO SETS FOR AUTOMOBILES PROMISE OF NEAR FUTURE

It is becoming quite apparent that practical and useful radio equipment for automobiles is not far away. Experimenters have been working with the problem for years, with some measure of success, but generally embarrassed by the awkwardness of the necessary antenna. In a set of recent design, which talks 15 to 20 miles and telegraphs 40, the antenna masts, like miniature telephone poles, are carried on hooks under the running board, and only installed, at front and rear of the car, when emergency demands their use. The talking equipment, of the latest vacuum-tube type, has been reduced to a practical degree of compactness.



PHOTOS COPYRIGHT, PRESS ILLUSTRATING SERVICE

All the Radio Equipment is Carried, without Crowding, in Odd Corners of the Automobile, the Antenna Masts and Wires being Folded under the Running Board When Not in Use

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MAKE INSULATING MATERIAL FROM FIBROUS SEAWEED

An almost inexhaustible supply of fibrous material, suitable for the manufacture of steam-pipe and refrigerating-plant insulation, exists in the matted seaweed which grows on the bottom of the ocean near the southern shore of Australia. Several companies have been formed for transforming the vegetation into marketable products. There are 4,500,000 tons, dry weight, of the weeds available, it is estimated, and as the beds are covered by only a few feet of water, the gathering of the plants is an easy task.

FRENCH FLIER GLIDES UNDER FAMOUS PARISIAN ARCH

A French airman, Lieutenant Godefroy, recently performed the feat of flying through the famous Arc de Triomphe in

French Airplane being Piloted by Lieutenant Godefroy through the Great Triumphal Arch of Paris

Paris, after practicing with a wooden frame of the same size. The plane's wing spread was 24 ft., a little more than half the width of the arch opening, which is 69 ft. in length. The flier stopped his engine, glided through, and then continued his flight.

POWERFUL ELECTRIC CURRENT FAILS TO KILL LINEMAN

Apparently dead for half an hour after his body had served as a conductor for a 7,000-volt current of electricity, a lineman in an eastern city recovered from the shock, climbed down from the pole on which he had been stricken, and resumed his work without medical attention. When the accident occurred, he was strapped near the top of the pole, splicing wires. After the current had been switched off, several men, using ladders, attempted to remove the seemingly lifeless body from the pole, but were unsuccessful. Suddenly the rigid muscles of the supposed corpse relaxed, and the lineman surprised the curious crowd which had assembled by extricating himself from the strap and descending.

¶A novel arc carbon of French invention consists of a solid rod inside a hollow cylinder, the space between being filled, if desired, with light-coloring substance. The arc formed at the end is rotated by a magnetic coil.

ODD ELECTRIC LAMP GIVES NONACTINIC RAYS

An electrical lamp has been developed in Europe which virtually consists of a metallic arc inside of a sealed bulb containing attenuated helium and neon gases. The wire anode terminates so closely to the edge of the hemispherical iron cathode that the current discharges across the gap spontaneously. The rays have an orange hue and are only slightly actinic, making the lamp useful in photographic dark rooms. It is also recommended for use in mines, and other places where inflammable gases may be present, because breaking of the bulb instantly extinguishes the light.

RESCUING OUTFITS PLACED ON SHORES OF LAGOONS

Along the shores of lagoons in a public park at Toronto, Canada, have been placed at regular intervals complete outfits for saving drowning persons or recovering the bodies of those who perish in the water. The outfits are hung on posts which bear signs calling attention to the contrivances, and giving instructions for their use. Each outfit includes a life buoy; a 16-ft. wooden pole, to the end of which are fastened three barbs, intended to be used in recovering bodies; a bottom drag, consisting of an iron bar to which are fastened numerous fishhooks and two ropes, and a ladder, 9 ft. long, equipped with hooks at one end so that it may be hung over the edge of a pier when necessary to effect a rescue.

One of the Complete Life-Saving Outfits Which Dot the Shores of Lagoons in a Public Park at Toronto, Canada. Signs on the Posts Bear Instructions

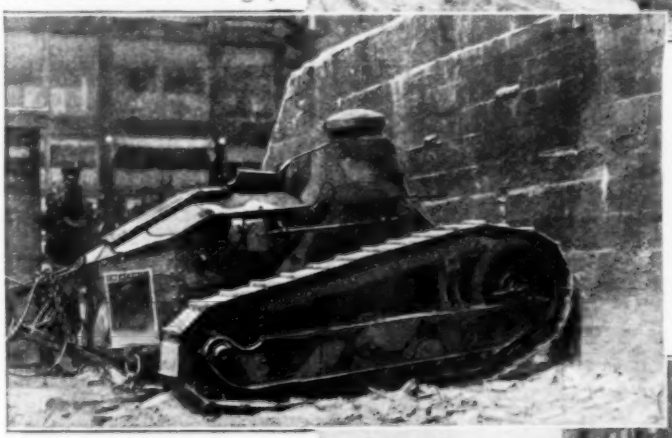
CAMP-BORN TANK PINES FOR LUSTY FARE

WANTED—Houses to wreck. If you want a house torn down free, apply to "ERMENTRUDE THE TANK," Pioneer Square.

THE above advertisement appeared recently in the Seattle newspapers. For life had become rather dull to "Ermentrude" after her exciting "Treat 'Em Rough" days in the Argonne and on the Meuse. "Ermentrude" sounds like the name of a perfectly parlor-broken young lady, but in this case it is a misnomer, for the youngster craves action and plenty of it.

Contractors erecting a new building in the down-town section of the city were confronted by the task of breaking up a concrete wall 16 ft. high, 83 ft. long, and 18 in. in thickness. The wall was estimated to weigh around 250,000 pounds. A fleet of heavy motor trucks had failed to pull the wall over. Breaking it up with hammer and drill would have been very costly. Finally the contractors hit upon the plan of giving "Ermentrude" a fling at it. She appeared upon the scene at noon and waddled into the excavation in charge of a crew of war veterans. Slowly she climbed a slight incline which separated her from the wall and, with a roar, butted the solid concrete. The wall shook slightly but did not succumb, although the doughty little hard-hitting tank made a scar three inches deep. "Ermentrude" backed away. A crowd of curious persons gathered and began to wager money on the contest. Again and again the tank assailed the wall. At twenty minutes past one, less than half an hour after "Ermentrude" appeared upon the scene, she brought it down with a crash, indifferently shaking off the half-ton chips of concrete that dropped upon her shoulders.

The Action has Started, and the Tank has Already Bumped Her Nose Once against the 18-Inch Thickness of Concrete



"Ermentrude the Tank" Appears on the Scene, Ready and Eager to Charge the Concrete Wall and "Treat It Rough"

The Wall has Surrendered, and Lies Broken before Its Conqueror, Which Is None the Worse for the Encounter or for the Shower of Concrete "Shrapnel"

"Ermentrude" mounted her vanquished foe, cast a calm, victorious look about her, and, pointing her nose about, waddled out to the street amid the cheers of a mob of onlookers, and went away in search of more worthy prey.

MACHINE LOADER HANDLES HAY IN BUNDLES OR LOOSE

A new loading machine, devised by a Minnesota inventor, handles hay and similar materials either loose or in bundles, with equal facility. A revolving drum with spikes like pitchfork tines, coöperating with a series of rake teeth, picks up the hay and throws it onto an inclined conveyor. Thus elevated to a deck or platform, it is transferred to another conveyor, at right angles to the first, which lifts it to the barn loft or into the body of a vehicle. Transverse slats on the inner side of the conveyor catch any loose grain that may escape from the bundles while they are being picked up or elevated, and return it to the deck.

The Revolving Pitchfork Drum at the Bottom can be Seen Here, as the Hay Loader, in the Lower Picture, Prepares to Move Up on the Haystack. How the Hay, Loose or in Bundles, Travels up the Conveyor to the Platform is Clearly Seen in the Upper View

ELECTRIC ARC CUTS ROCK FOR TUNNELING WORK

Use of the electric arc for cutting rock in tunneling operations proved quite successful in recent experiments in California. The rock is chipped off by its own expansion, and requires an arc that is thrown forward from its electrodes like a flame. For this reason a three-phase current was used, creating a magnetic field that forced the arc forward. The electrodes were two-inch carbons, which could be contacted or separated two inches. With current of 450 amperes per phase at 40 volts, the rock was removed at the approximate rate of one pound a minute, and the cost figured out at about one-half cent a pound.

SHIFTING ASPHALT IN LAKE BENDS BORING TOOLS

Attempts to sound the great asphalt lake on the Island of Trinidad are impeded by the almost imperceptible but irresistible shifting of the mass in the enormous reservoir, the boring tools being bent and their progress through the semisolid material halted. Recently a new low level of 150 ft. was reached, but the bottom was not found. In six weeks the record hole shifted 25 ft. on the surface, and it was discovered that the movement extended 100 ft. downward. There was a slight counter-movement between 25 and 50 ft. below the surface. Boring was done by driving a small pipe into the lake to the desired depth, withdrawing it with its core of asphalt, and then driving a 2-inch pipe in the same direction at the same location. A jet of water was used to remove material forced into the larger pipe.

¶When the Pacific fleet was 150 miles southwest of San Diego, Calif., a short time ago, a party of newspaper men were taken out by Capt. Lowell H. Smith in a De Haviland plane, and secured photographs of it. These the flier later took to San Francisco, between 9:22 a. m. and 5:45 in the afternoon.

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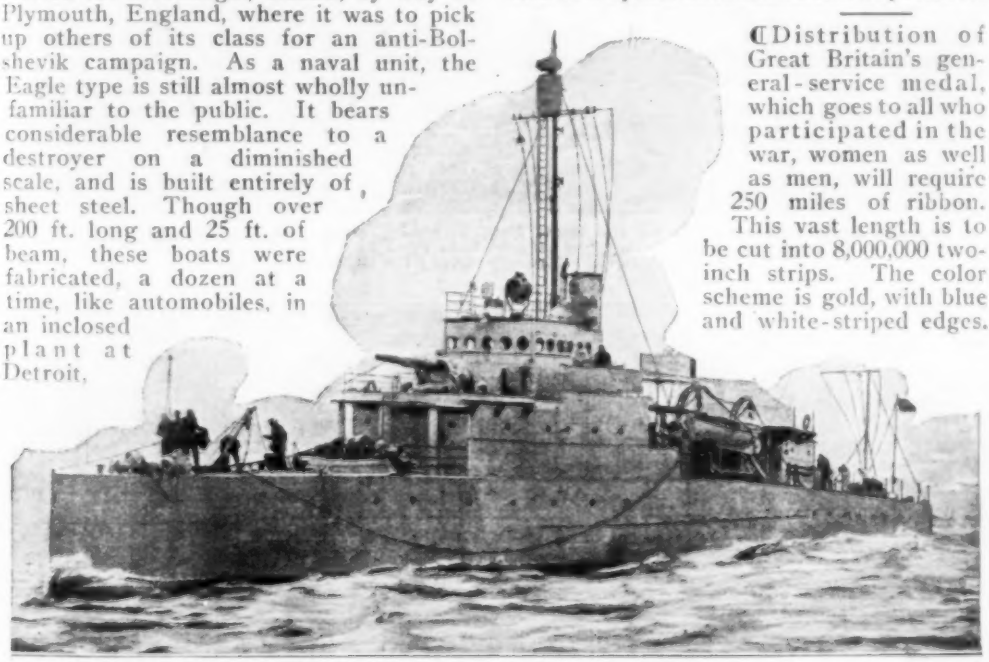
DRESSING CONTEST FORMS PART OF HOSPITAL SPORT PROGRAM

IN the great hospitals maintained by the United States government for the reconstruction of its wounded defenders every effort is made to encourage a healthy, cheerful morale, free from discouragement and gloom. For this purpose fresh air, sunshine, and competitive exercises have been found more beneficial than whole carloads of pills. Thus the illustration portrays one of the most hotly contested events in a recent field day, or athletic carnival, staged by the crippled veterans. Three contestants, each handicapped by the loss of a hand, are racing to see who can most quickly dress himself. That the performance is locally considered an interesting event is indicated by the large number of spectators, who watch the competition with close attention, while the referee gives the affair all the formality of a wrestling match for a championship. The contestants usually develop a surprising dexterity in a short time.

EAGLE BOATS ON THEIR WAY TO ARCHANGEL, RUSSIA

A short time ago "Eagle" boat "No. 2" started for Archangel, Russia, by way of Plymouth, England, where it was to pick up others of its class for an anti-Bolshevik campaign. As a naval unit, the Eagle type is still almost wholly unfamiliar to the public. It bears considerable resemblance to a destroyer on a diminished scale, and is built entirely of sheet steel. Though over 200 ft. long and 25 ft. of beam, these boats were fabricated, a dozen at a time, like automobiles, in an inclosed plant at Detroit, Mich., the remarkable story of which was told in Popular Mechanics last September.

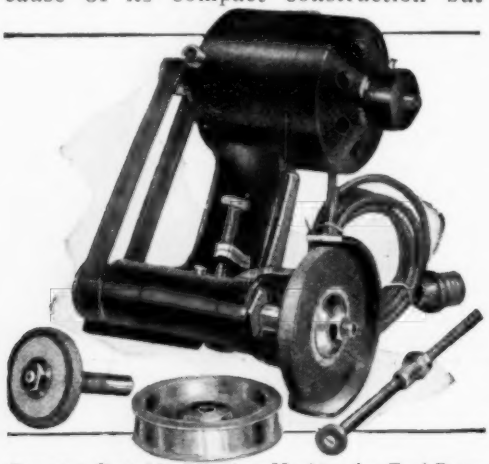
¶Distribution of Great Britain's general-service medal, which goes to all who participated in the war, women as well as men, will require 250 miles of ribbon. This vast length is to be cut into 8,000,000 two-inch strips. The color scheme is gold, with blue and white-striped edges.



"Eagle" Boat "No. 2" on Its Way to Archangel, Russia, via Plymouth, England: This Is One of the Best Photographs Yet Taken of the New Type of Naval Unit, Which Is Over 200 Feet Long, Made of Sheet Steel, and Built, a Dozen at a Time, in a Detroit Factory

PORTABLE GRINDER DOES WORK OF LARGE FIXED MACHINE

A portable grinding machine, small because of its compact construction but

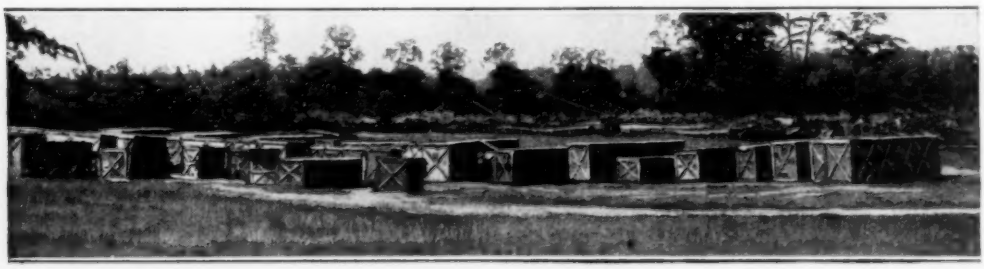


Compact, Portable Grinding Machine for Tool-Room and Machine-Shop Use: The Spindle Is Hollow to Take the Shaft of the Internal Grinder at the Right

able to take care of all the work of tool room or machine shop, is now offered by a Wisconsin manufacturer. The electric driving motor, of ⅛ to ½ hp., is immediately above the spindle and out of the operator's way. The grinding wheels are interchangeable, and for interior grinding an adjustable shaft is fitted into the ferrule of the spindle, which has a 5/16-in. opening. In use the grinding wheel is moved over the work, instead of the usual reverse process.

GOVERNMENT BUILDS EASTERN TERMINAL FOR AERIAL MAIL

The usual difficulties were encountered in finding a suitable location for the eastern terminal of the aerial mail. Some fields were rejected because too small, others because poorly located. The site finally acquired was not in New York, as might have been expected, but in the northern part of Newark, N. J. Even here, however, weeks had to be spent in dynamiting stumps, grading and leveling, before the surface could be used. While this work was going on, plane and hangar parts were collected on the ground. Airplane mail received at the field is rushed by automobile to New York City, nine miles away.



The Boxes of Airplane Parts, Engines, and Other Paraphernalia Were on the Field Almost Before It was Cleared, and in the Background may be Seen the Felled Trees and Blown-Up Stumps of the Clearing, Ready for Removal

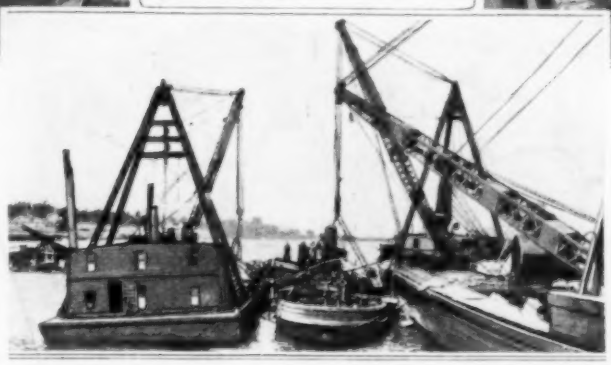
Steel Roof Trusses, and Other Hangar Parts, Are Ready for Assembling. Work That can be Done While the Final Stumpage and Brush are Cleared from the New Eastern Terminal Landing Field for the Aerial Mail Service

TUG SUNK NINE YEARS AGO SALVAGED BY LIGHTER

The Boiler, Detached from the Sunken Hull of the Tug, was Brought to the Surface First, Reducing the Vessel's Weight

Funnel of the Long-Submerged Boat as It Appeared When Emerging from the Waters of Mud Lake

This Picture Shows the Steel Cable Slings Which were Used to Lift the Long-Submerged Wreck from Its Muddy Resting Place



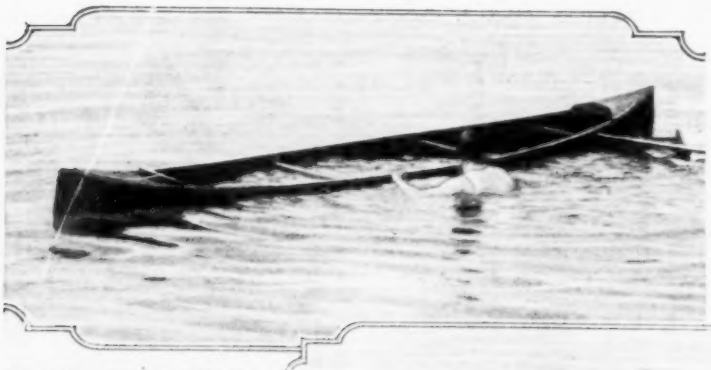
Resurrecting the Steam Tug "General": Powerful Steel Cranes on a Huge Lighter were Employed. The Illustration Depicts the Hull as It Looked Just after It Rose from the Water. It was Pumped Out, Patched, and is being Repaired

Buried in silt at the bottom of Mud Lake, near Detour, Mich., for nearly nine years, the steam tug "General" was salvaged recently, and soon will be in service again. The boat sank in 55 ft. of water in 1910, after a collision with a steamer, and settled on its side until the port rail was level with the bottom of the lake. A large lighter, equipped with two steel cranes, was moored over the submerged craft. It was a comparatively easy matter to recover the boiler, which was raised by one of the cranes after it had been disconnected from the hull. Salvaging the hull was more difficult. Three holes were dug in the mud on each side of the wreck, and into these were directed streams of water under high pressure. By this means tunnels were bored under the ship. Steel cables were passed through the tunnels, and formed into slings, which were attached to the cranes. When the tug was within 12 ft. of the surface, the lighter and its burden were towed five miles out in the lake to clearer water, where the boat was further elevated, pumped out, patched, and floated. The vessel was then taken to a harbor, and the work of repairing it was begun.

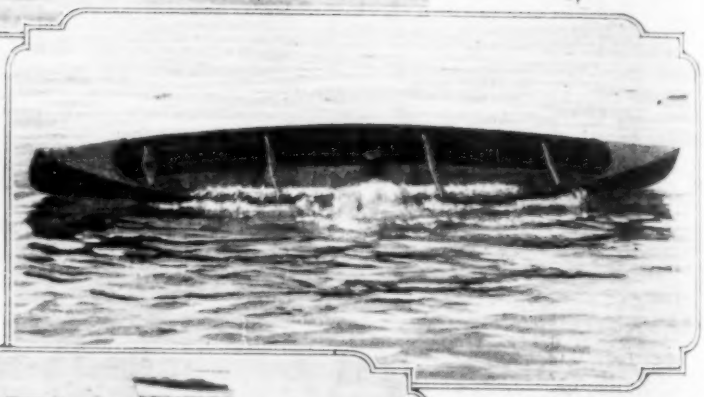
FARM IMPLEMENTS DAMAGED BY LACK OF SHELTER

Damage done to farm machinery through exposure amounts to $1,000,000 annually, according to an estimate made by experts at the Agricultural College of the University of Wisconsin. It is pointed out that most farm implements are not used more than three or four weeks out of the year, and that in many instances they are allowed to stand without shelter during the remainder of the 12 months. Figures have been compiled to show that a shed costing $400 will pay interest on the investment at the rate of 22 per cent when housing $1,000 worth of equipment.

CANOEISTS SHOULD KNOW HOW TO RIGHT A SPILL



When a Canoe, Capsized in Deep Water, has been Righted, It is Naturally Waterlogged. It can be Emptied by Lifting the Near Side as High as Possible, and Then Suddenly and Quickly Bearing Down upon It



This Throws Some of the Water Out over the Canoeist, Who Is Already Wet and does Not Mind More Drenching. The Operation must be Repeated a Number of Times, But in the End It will Eliminate Most of the Water

The Next Step Is to Climb into the Skittish Craft. This Should Always be Done over the End, and Never over the Side, as the Latter Way will Surely Cause Another Spill, and the Canoeist may be Caught Underheath

Centering the Weight Is, of Course, the Secret of Canoe Safety, and When That is Remembered Even Such Apparently Reckless Stunts as That Shown at the Right may be Performed without Accident, but Are Not Advisable

AS WELL AS THE WAY TO KEEP FROM HAVING ONE

Changing Seats Is the Action Responsible for Many Canoe Accidents. The Only Really Safe Way to Do It Is for One Canoeist to Pass beneath the Other, Thus Keeping Perfect Sidewise Balance

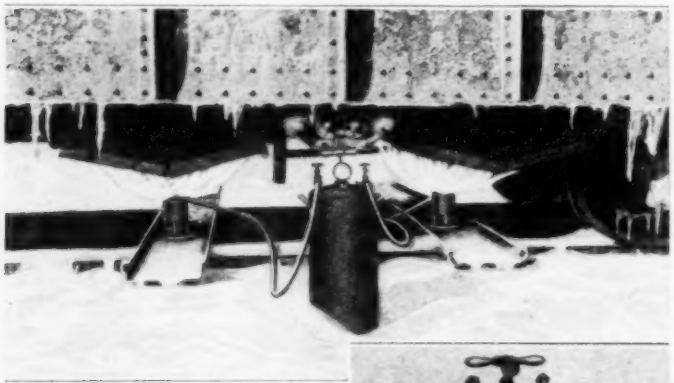
A Canoeist should Not Stand Up; but if He Must, the Only Safe Place to Do It Is in the Exact Center of the Canoe

When He Shifts His Position, the Picture Tells the Froper Method of Doing It—along the Center Line, with a Hand on Each Gunwale

The Correct Paddling Position Is on One Knee, with the Body So Balanced That the Canoe Rests in Perfect Equilibrium on an Even Keel. In This Attitude an Experienced Canoeist can Balance against Rough Seas or Current

PORTABLE OIL BURNERS THAW COAL FROZEN IN CARS

Not only is the freezing of coal in railway cars a frequent occurrence, but removing the solidified mass is the hardest kind of labor. A portable thawing outfit can now be obtained which is placed directly under the car hoppers. It burns kerosene oil, contained in a 10-gal. steel tank equipped with a powerful air pump. A pressure gauge, safety valve, and oil-regulating valves are also fitted to the tank. Two large burners are used, strongly constructed for hard service, and consuming 2 to 5 gal. of oil an hour. Connection with the tank is made by oil-proof hose. The outfit works rapidly, and in one instance thawed a completely frozen car of pea coal in less than two hours.



Kerosene-Burning Heaters Applied to the Bottoms of Freight-Car Hoppers to Loosen Frozen Coal So That It can be Unloaded

Near View of Thawing Apparatus, Showing the Oil Tank and Two Burners, with the Hoses Which Connect Them: On Top of the Tank Is the Handle of the Air Pump

MOTORWOMEN OPERATE CARS IN SOUTHWESTERN CITY

Experiments with women as street-car employes have resulted in adverse decisions in a number of cities. An exception is Albuquerque, N. M., where motorwomen are a common sight on the local transportation lines. One reason for this lies in the fact that a large part of the population consists of families in which some member is a sufferer from tuberculosis, brought to the southwestern city to be benefited by the climate. In many instances the women of these families are forced to take the part of breadwinners for afflicted relatives.

The company which operates the street cars has established a school in which motorwomen are educated for their positions. After a few hours of oral instruction, a student is placed on a car and given charge of a controlling lever, while a teacher stands beside her to correct her mistakes and to guard against accidents. In about 10 days a beginner is allowed to take entire charge of a car. Khaki uniforms, consisting of a short skirt, a loose blouse, and a cap, are worn by the female employes. Wages are paid on a sliding scale, 90 days of service being required to obtain the maximum pay.

UNDERGROUND TEMPLE FORMS MUSEUM ENTRANCE

The directors of a western museum are spending $40,000 to provide a unique subway entrance to the building, now almost inaccessible because of its position on a sharp rise of ground. Workmen are tunneling into the precipitous hillside below the museum, while others sink an 80-ft. elevator shaft to meet the tunnel. This improvement will in itself make the museum a curiosity; yet, in addition, the tunnel is to be made a picturesque memorial to a strange Indian race, dominant in many parts of Mexico at the time of the Spanish conquest. The portal and sides of the arch-roofed subway will be covered with inscriptions and lined with statues and pilasters, all facsimiles of originals found in the ancient temples of the Mayas. Soft lights will shine on fierce old Maya gods and tangled hieroglyphics. More than 200 ft. within the hillside, at the end of the horizontal passage, will open the large room in which visitors will wait for the elevator. In

Tunnel Entrance to the Southwest Museum, Los Angeles, California: This View Shows the Mouth of the Subterranean Passageway, and Indicates Its Distance from the Building. On the Right Is a Picture Taken from the Inside of the Bore

strange contrast to its utilitarian purpose, the vault will be fitted as an exact replica of the weird, colorful Temple of the Sun in Yucatan.

RIVET-HEAD CATCHER INSURES SAFETY FROM FLYING METAL

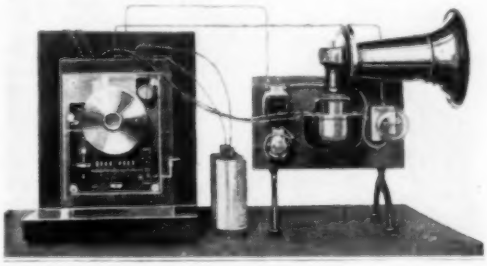
Cutting rivets, either by machine or with chisel and hammer, is attended by considerable danger. The severed heads are propelled away from the work with sufficient force to cause painful injury, even at some distance. A new safety attachment is a sleeve that fits over the shank of the cutting tool, with a hollow at the end that incases the rivet head.

The Sleeve That Incloses the Rivet-Cutting Tool Prevents the Severed Head from Flying Away, and Perhaps Injuring a Workman

When the latter is cut loose, it drops safely and harmlessly into the pocket formed by the hollow.

ELECTRIC HORN'S CODED CALLS SUMMON DISTANT MEN

To locate, at the time he is wanted, any particular individual in the vast ramification of a modern coal mine, is a task of some magnitude. A signaling method which has lately come into successful use



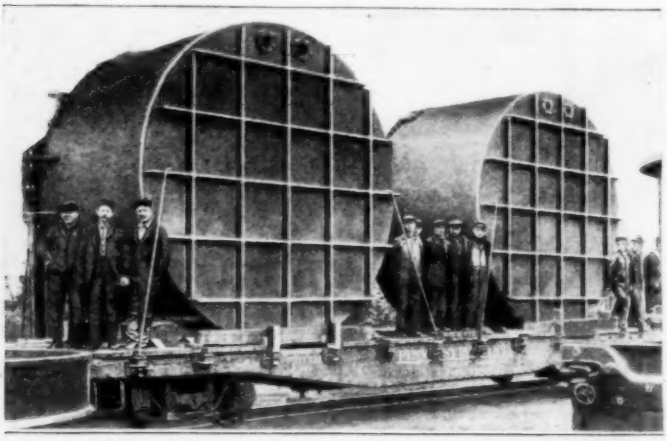
Coding Switch, Run by Clockwork, and Dial with Code Numbers Are in the Case at the Left. Connected to the Big Motor-Driven Horn at the Right

employs an electric motor-driven horn of the type installed on automobiles, but much larger. The motor, wound for the voltage of the mine's power supply, is connected to a coding switch run by clockwork, and each individual likely to be wanted is assigned a code call. When the operator turns a dial to the corresponding number, the call is sounded to all parts of the mine, and the wanted man responds at the nearest telephone. A signal bell and pilot lamp are mounted with the horn, for less-distant signaling.

¶ King Albert of Belgium has purchased 15 seaplanes of various types, with which he will inaugurate an experimental service in the Congo.

IRON VATS DECLARED LARGEST EVER SHIPPED BY RAIL

A pair of cast-iron vats, each weighing 21 tons and 14 ft. in diameter, were recently produced by a foundry at Buffalo, N. Y., to be used as dissolving tanks in a chemical plant at Perryville, Md. Of several possible routes to their destination, only one could offer sufficient bridge clearance to pass the big tanks, which were propped up on edge on a heavy flat car. They are stated to be the largest tanks ever shipped by rail.



Only One Railroad Had Sufficient Bridge Clearance to Pass These Big Cast-Iron Tanks, Which, Mounted on a Flat Car as Shown, Stood 14 Feet above Its Deck

NEW SEAMLESS METAL BOAT COSTS LESS THAN WOOD

A new method of manufacturing metal boats, which originated in England and has been patented in that country, in America, and on the continent, promises to make possible the production of small craft at a cost lower than that of wooden boats before the war. The new boats are seamless, and may be made of any of the coated sheet steels, or other metals suitable for marine work. For a plant of ordinary size, the production is calculated to equal one boat per day per man. Lifeboats, flying-boat hulls, and seaplane pontoons are within the scope of this method of construction.

¶ Rust-proof metallic coatings for iron and steel are discussed at length in a circular issued not long ago by the Bureau of Standards, and certain materials and coating methods are recommended for various purposes.

PEACE TREATY HAS INTEREST FOR AMERICAN INVENTORS

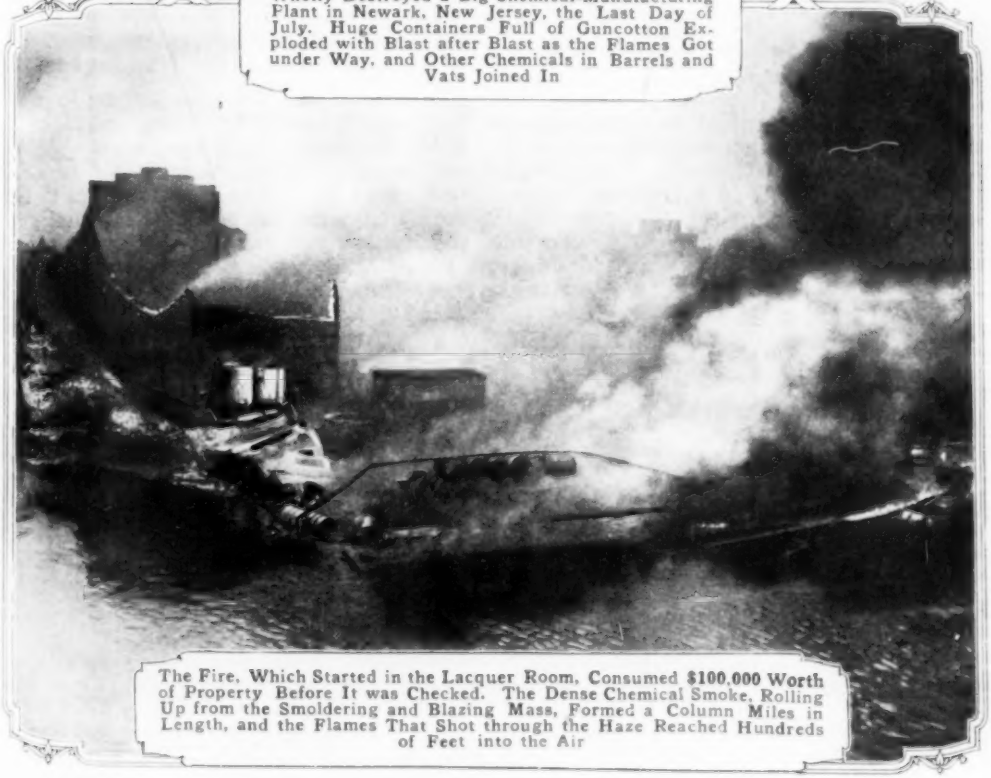
American inventors would do well to familiarize themselves with Section 7, Part 10, of the Peace Treaty, entitled "Industrial Property." Among other things this section provides that patents held by citizens of allied countries at the beginning of the war shall be restored to the original owners as from the coming into force of the treaty. A grace of one year after that event will be granted for the payment of dues, etc., on patents acquired before Aug. 1, 1914, or which, except for the war, might have been acquired since that date. Other paragraphs consider allied use of German patents, failure to work patents during the war, and steps necessary for the prosecution of applications pending since the beginning of the conflict.

FREE HOT WATER SUPPLIED IN CANADIAN PARK

Hot drinks can be served at picnics in a recreation park at Toronto, Canada, without the troublesome operation usually necessary to obtain boiling water in such places. This is made possible by a convenience placed on the grounds by the city authorities in the form of a gas water heater, which delivers hot water in any quantity through a faucet to all who care, and have occasion, to use it. No charge is made for the service. A wooden shed houses the heater, and a sign on the building calls attention to the fact that hot water is free. The cost of operating the device has been found to be small, but it adds greatly to the pleasure of the park visitors.

TONS OF GUNCOTTON IN SPECTACULAR FIRE

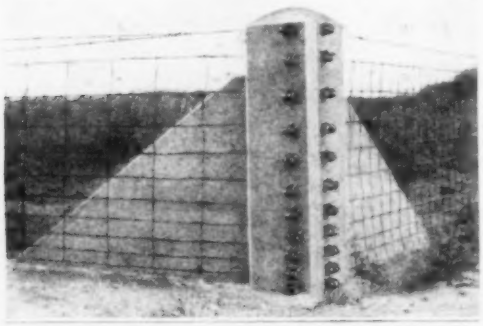
The Most Spectacular as Well as the Most Dangerous Fire in the City's History Almost Wholly Destroyed a Big Chemical-Manufacturing Plant in Newark, New Jersey, the Last Day of July. Huge Containers Full of Guncotton Exploded with Blast after Blast as the Flames Got under Way, and Other Chemicals in Barrels and Vats Joined In



The Fire, Which Started in the Lacquer Room, Consumed $100,000 Worth of Property Before It was Checked. The Dense Chemical Smoke, Rolling Up from the Smoldering and Blazing Mass, Formed a Column Miles in Length, and the Flames That Shot through the Haze Reached Hundreds of Feet into the Air

TIGHTENERS FOR FENCE WIRES BUILT INTO CORNER POST

A corner post of heavy concrete, with wire tighteners built right into it, is an improved arrangement for keeping long



Each Fence Wire Goes through the Concrete Corner Post and is Wound on a Little Drum, Which is Tightened with a Crank

wire fences tuned up and preventing sagging. Each wire goes through a hole in the post and terminates in a little drum with a ratchet, by means of which the farmer can tighten them up with a crank in a hurry.

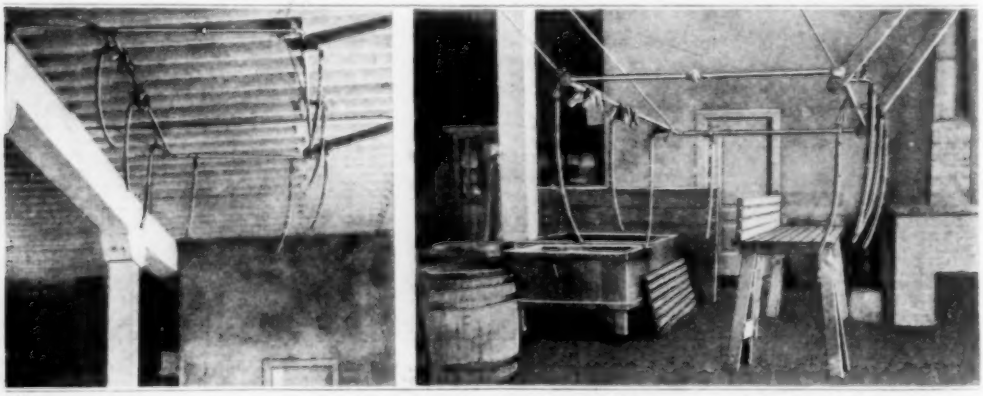
FISH-CLEANING FAUCETS HELD OUT OF WAY WHEN NOT IN USE

In the crowded plant of a great seafood company has been installed a simple fish-washing arrangement which effects a remarkable saving in floor space. Consisting of a rectangular frame of water piping to which are attached eight faucets with as many short lengths of hose, the apparatus is held close to the ceiling when not in use. But when a boat delivers a cargo of fish, the frame is lowered to operating position, so that each of the eight workmen has his own faucet. They are thus able to wash the blood from the fish as fast as they come from the cleaners who have slit them open and removed the entrails.

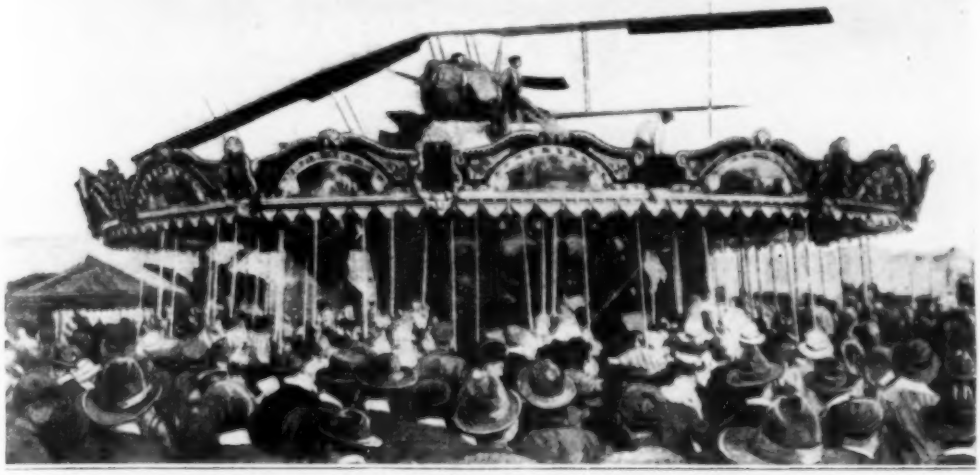
SOLDIERS ENTITLED TO PAY FOR ARMY INVENTIONS

Soldiers who invent devices for the betterment of the military service should receive the pecuniary benefits which accrue through the adoption of their inventions. This was announced recently when it was disclosed by the War Department that contractors, in some cases, have patented the ideas of army men in their own names, incorporated them in supplies sold to the government, and collected royalties that legally belonged to the originators. Soldiers whose inventions have been appropriated in this manner are advised by the department to file suit in the Court of Claims for compensation. The Inventions Section has been transferred from the War Plans Division to the Operations Division of the General Staff, and all soldiers, irrespective of rank, are urged by the War Department to submit to that body, their ideas for improving army supplies.

¶Alcohol is manufactured from calcium carbide in a plant which recently began operations in Switzerland. About 12,000,000 gal. can be produced annually in the factory, and at a price of $3 a gallon the undertaking is expected to make a reasonable showing of profits.



The Movable Faucet Rack is Shown at the Right in Operating Position, One Faucet Available for Each of the Eight Fish Washers during the Busy Season. When the Catch has been Disposed Of, the Apparatus is Pulled Close to the Ceiling, as at the Left, to Permit the Use of the Floor Space for Other Purposes



AIRPLANE LANDS ON TOP OF CROWDED MERRY-GO-ROUND

THE fairground at Calgary, Can., was recently the scene of an unparalleled airplane accident. The fair had run to its last day, so the crowd was getting its final taste of the traditional delights of the carnival side shows. The merry-go-round groaned beneath a capacity crowd. Overhead flew an airman of the Canadian army, reputed to have downed 39 German planes. In the observer's cockpit of his plane he carried two boys, sons of a local official. One of the boys is said to have grown excited and pulled a control wire. At any rate, the plane swung down, headed for a fatal smash-up. Luckily it never reached the ground, but encountered the top of the merry-go-round, the guy wires catching the landing wheels and holding the... fast. Airman and boys climbed out uninjured.

OCEAN BOTTOM TO BE DREDGED IN SEARCH FOR DIAMONDS

To supply the world's undiminishing demand for diamonds a strong company is reported formed for the purpose of dredging the bottom of the Atlantic Ocean. This method of mining the sparkling stones is unusual, yet may meet with some measure of success, as a "chimney" has for years been known to exist off the southwest coast of Africa. Although never definitely located, its existence is considered certain because of the repeated discovery of diamonds in the sand dunes along the coast.

PRINT-SHOP BUFFING MACHINE ADAPTED TO MANY USES

A machine that cleans and buffs linotype matrices, cleans keyboard cams, grinds knives, molds, cam rolls, etc., drills holes up to 3/8 in., and routs cuts and plates quickly to any desired depth, is a recent addition to the growing list of printing-office accessories. The feature of the machine is its steel matrix tray, in which a whole font of matrices may be clamped for cleaning in one operation, both sides being buffed by reversing the tray. As the back of the tray is removable, the matrices may be inspected from all sides, and defective ones immediately detected. The tray may also be used for hand cleaning. The removable motor, equipped with buffer, grinder, drill, or router, is easily carried to the work in any part of the shop. The standard supplied is equipped with a swinging work table.

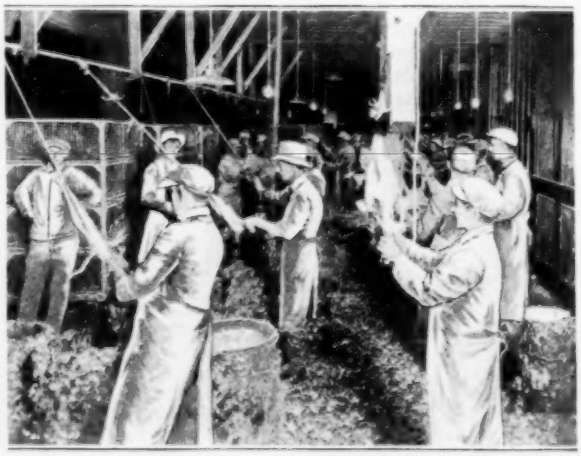
Electrically Driven Buffing Machine for Printing-Office Use, with Special Tray, Seen in Detail Below, for Holding Matrices to be Cleaned

FEED CHICKENS BUTTERMILK FROM LARGE DAIRY

Sixty-Five Thousand Chickens can be Fattened in This Large Feeding Room, Which is Filled with Four-Decked Steel Coops, Mounted on Wheels and Arranged in Rows with Aisles Between. Along the Sides of the Cages Are the Troughs in Which Buttermilk is Poured

VAST quantities of buttermilk that formerly were allowed to go to waste by a large Indiana dairy are now utilized for fattening thousands of chickens, and the poultry-dressing department, added to the plant when the value of the by-product was realized, has become a real rival of the churns. The latter are capable of making 100,000 lb. of butter each week, which means that thousands of gallons of buttermilk are available.

Poultry is bought over an extensive territory through branch stations, from which it is brought regularly to the main plant. An enormous feeding room, in which 65,000 fowls can be kept, is filled with four-decked steel coops, mounted on wheels and arranged in rows with aisles between for convenience in feeding. Each deck of the coops is provided with two feed troughs, placed on the sides. In addition to buttermilk, the chickens are fed a mixture of corn meal, oatmeal, and rolled oats. Young chickens are fed in the plant 14 days before they are killed, while older fowls have this period reduced to seven to ten days. After being killed and picked, the semidressed poultry is cooled in a room with a temperature of 34° F., and then graded and packed, 12 to each box, for shipment.



In the Picking Department a Large Force of Men is Kept Busy Removing the Feathers from Poultry. The Fowls are Then Cooled, after Which They are Packed in Boxes for Shipment

It has been found that the buttermilk diet not only fattens chickens rapidly, but that it gives their flesh a delicate flavor not obtainable in any other way. Everything about the feeding room is kept scrupulously clean

in order to insure a superior product. This is true also of the rooms in which the fowls are killed and dressed. The method of slaughtering is as humane as possible.

CHEMICAL FILTERS OF WOOL SUBSTITUTED FOR COTTON

Discovery that wool is superior to cotton as filter material, in the manufacture of picric acid for war purposes, has awakened interest in its use by plants producing other chemicals. Although it cannot be used for products of an alkaline nature, since wool is destroyed by alkalis, the experience of war industries indicates that in plants manufacturing tungstic acid, magnesium chloride, Epsom and Glauber's salts, or the sulphates of aluminum and zinc, filters of wool instead of cotton would be of advantage. Wool fibers do not absorb the precipitated matter, and if lightly treated with sulphur will not stain so readily as cotton. The wool pads, therefore, may be washed repeatedly, while the cotton can be used but once.

LOCOMOTIVE ON BIG TRAILER HAULED BY MOTOR TRUCK

The extraordinary spectacle of a locomotive being hauled about the city by a motor truck was the most striking feature of a recent carnival parade in Portland, Ore. The railroad engine, resting on an 8½-ton rubber-tired trailer, was jacked up with its wheels free and kept running during the trip, which covered some 15 miles. The locomotive, though of an old model, weighed 21 tons, and its supporting timbers about three tons more. The five-ton hauling truck had no difficulty with its remarkable load, however, even on grades.

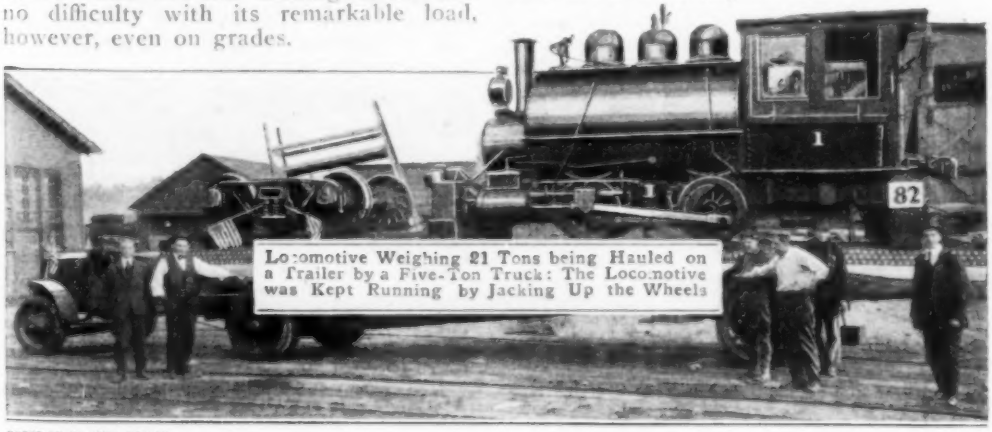
REPLACING LOST SPECTACLES OF AGED FRENCH REFUGEES

A good many persons are constantly forgetting their glasses, even in the most peaceful circumstances. So it is not to be

New Spectacles for Old Eyes—a Kindly Provision of American Relief Commissions, Which are Supplying Spectacles to Aged French Refugees Who Lost Theirs during the War

wondered at that great numbers of aged French refugees, fleeing before the invader, left their spectacles behind them, and have been unable to do any reading since. American relief commissions have met this contingency, as they have so many others, and the old people are finding new joys in the restoration of their visual powers.

¶Two million bushels of grain can be handled daily by an elevator in Canton Md. Conveyor and elevator belting installed in the building totals 44,254 ft. in length, and weighs 131 tons. It was shipped to the elevator on seven box cars from a factory in Ohio.



Locomotive Weighing 21 Tons being Hauled on a Trailer by a Five-Ton Truck: The Locomotive was Kept Running by Jacking Up the Wheels

PHOTO BY GILLIAMS SERVICE

TRUCK FOR CHAMBERMAIDS COMPLETELY EQUIPPED

Everything needed by a chambermaid in her work can be carried conveniently on a rubber-tired truck designed for use

With Its Shelves and Compartments Filled, This Rubber-Tired Truck Becomes an Able Assistant to Every Hotel or Apartment-Building Chambermaid

in hotels and apartment buildings. The vehicle is of all-metal construction, and has shelves for clean bed linen, towels, and wash cloths. At one end is a large canvas bag for soiled articles. A carpet sweeper, a broom, a feather duster, and other cleaning utensils, are placed at the opposite end. Compartments on top hold soap, electric-light bulbs, safety pins, and other sundries.

STOPS AND STARTS BIG TRUCK ON TWO-TO-THREE GRADE

Advocates of the system of applying power to all four wheels of a motor truck are jubilant over the recent performance of a vehicle of that class on an artificial grade, near Billings, Mont. The incline is 12 ft. high and 18 ft. long, giving a 66⅔-per-cent slope, hitherto considered practically impregnable to motor-car attack. The forbidding acclivity was not only surmounted by the 6,400-lb. truck, but the driver actually stopped at mid-height, held the wheels easily with the powerful brakes, and then resumed the ascent from that critical position, going over the top without any sign of distress from the motor.

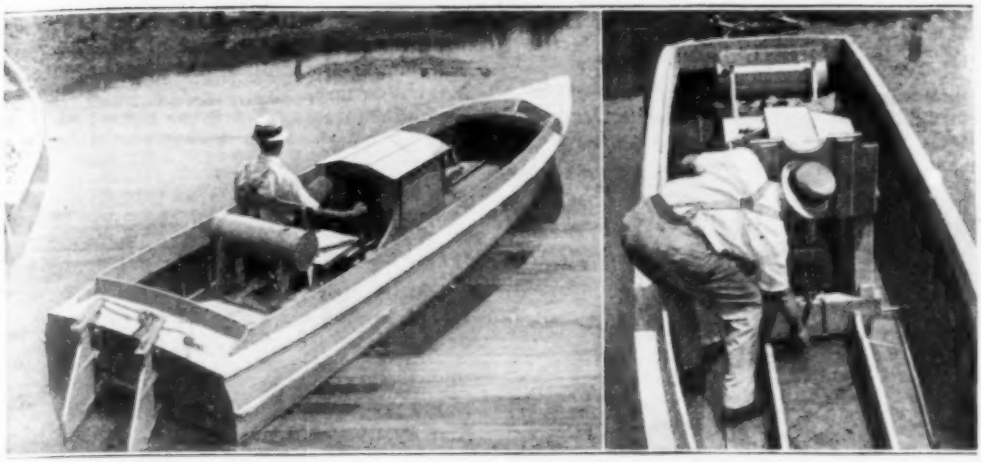
NAVAL RANGE FINDERS SHOW WAR-TIME IMPROVEMENT

Significant of the progress made during the war in connection with naval guns is the range finder exhibited recently at London by a British concern. Not only is the device considerably larger than those in use before the outbreak of hostilities, but it is capable of regulating fire at much greater distances and with more accuracy than older models. In 1904, when the British navy adopted the range finders with which it entered the war, 5,000 yd. was thought to be the utmost distance at which accurate firing could be done. In the battle of Jutland, more or less precise firing was done at 24,000 yd. by the use of modern range finders.

PLAN NEW SUBMARINE CABLE UNDER PACIFIC OCEAN

Present submarine-telegraph cable service between the United States and Japan being unsatisfactory, a company has been formed in the latter country for the purpose of laying another line across the floor of the Pacific Ocean. About $25,000,000 will be raised by the oriental financiers for the project, and additional funds are expected to come from this side of the water. It is believed that the new cable will stimulate trade and good feeling between the two nations.

In the First Picture the Truck is Seen Starting up the 66 2/3-Per-Cent Grade; between Positions One and Two It was Stopped and Held by Its Brakes, Starting Again and Going Triumphantly over the Top as the Last Picture Shows



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Specially Constructed Boat Driven by an Engine Taken from a Small Automobile: In the Left-Hand Picture, between the Two Blades of the Rudder, can be Seen the End of the Channel in Which the Propeller Operates. The Right View Shows the Driver Cranking His Engine Just as Though He Were on a Country Road Instead of a River

ENGINE FROM SMALL AUTO DRIVES CURIOUS BOAT

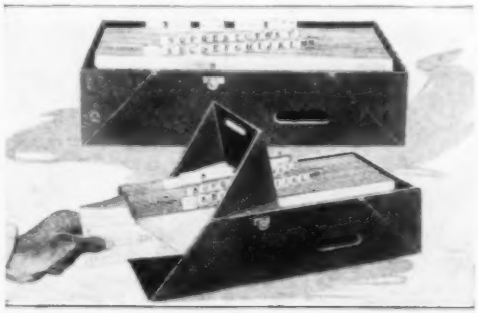
Engines removed from small automobiles have frequently been used as boat motors, but now an enterprising builder has completed a boat especially designed for that kind of motive power. The hull, 25 ft. long and 5½ ft. beam, is strictly flat-bottomed and draws but a few inches of water. Like many other motorboats it has a channel built into the bottom, running in from the stern, in which the propeller operates, wholly above the bottom line of the boat and protected from weeds; it also is provided with a double rudder, one blade at each side of the channel, forming practically a flexible extension of the current of water from the propeller.

CONSTRUCT BIG LUMBER BOOM IN MISSISSIPPI RIVER

Loading lumber for overseas shipment will be facilitated by a large floating inclosure, or boom, and an enormous wharf that are being constructed in the Mississippi River, at New Orleans, by a lumber firm of that city. The boom will be 1,800 ft. long, and extend into the river a distance of 600 ft., while the wharf will be built on the shore alongside the inclosure. The floating timbers forming the boom will be retained by piles driven into the bottom of the river. At either end are gates, which will permit ships to enter and leave the loading space. The lumber will be dumped into the boom from the wharf, and lifted into the holds of vessels from the water. A storage yard will be located on the shore back of the wharf.

CHECKS AND DEPOSIT SLIPS SORTED IN INDEXED CASE

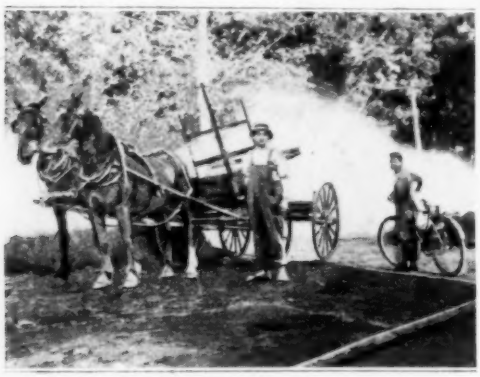
A new indexed case, designed especially for use in banks, is so constructed that both checks and deposit slips can be sorted in it. The device consists of a sheet-steel tray, 16 in. long, 8 in. wide, and 4 in. high, the ends of which are pivoted to swing upward, containing the indexing cards strung on an offset rod which passes through the box from side to side. Checks are inserted between the cards on one side of the rod, while deposit slips are placed in their proper classification on the opposite side. By lifting the ends of the tray, the ends of the papers are exposed, and they can be removed with ease.



Indexed Case for Checks and Deposit Slips: The View Below Shows How Papers can be Removed from the Device

WAGONLOAD OF HAY BURNED IN UNUSUAL FIRE

The calm of a residential street in a Canadian city was rudely shaken recently when a wagonload of hay, drawn by two



Picture Taken Shortly After Fire had Destroyed a Wagonload of Hay in a Canadian City Street: Friction is Believed to have Started the Blaze

horses, on the thoroughfare suddenly burst into flames. By quick work, the driver was able to save the animals by unhitching them from the wagon. An alarm brought the fire department to the scene, and it was possible to prevent the destruction of the running gear of the conveyance, though the hay and the hay-rack were almost entirely consumed. It is believed that the unusual blaze was started by friction between an iron bar on the rack and the hub of one of the wagon wheels.

RECORD MOUNTAIN ASCENTS WITH PILES OF ROCKS

Mountain-climbing history is recorded in a novel manner on the summits of California peaks. When an ascending party has reached its elevated destination, each member places a rock on a pile

Each One of the Rocks in This Pile Represents an Ascent of the Mountain on Which It is Located. Fifty Years Were Required to Accumulate These

which has accumulated there through similar action on the part of all who have negotiated the eminence. In the case of Mt. Whitney, the highest peak in the United States and one of the most difficult to climb, the pile of rocks is very small.

WOULD STUDY TROPICAL ILLS IN SHIPBOARD LABORATORY

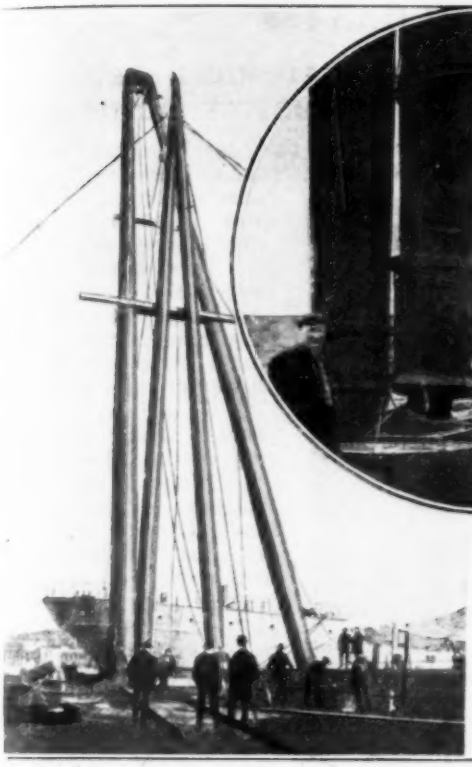
Diseases of the tropics, where so many maladies thrive, may form the subject of intensive local study, if the suggestion of an eminent English physician continues to sustain the interest it has already aroused in scientific circles. The plan is to outfit a ship with all the necessary paraphernalia and laboratory equipment, man it with students of medicine representing various nations, and visit the tropical possessions of America, Great Britain, France, and Italy. Inspiration for those now combating disease in the tropics, and a closer bond of international friendship, would undoubtedly result from such an enterprise.

ENORMOUS WOODEN DERRICK MADE OF GIANT TREES

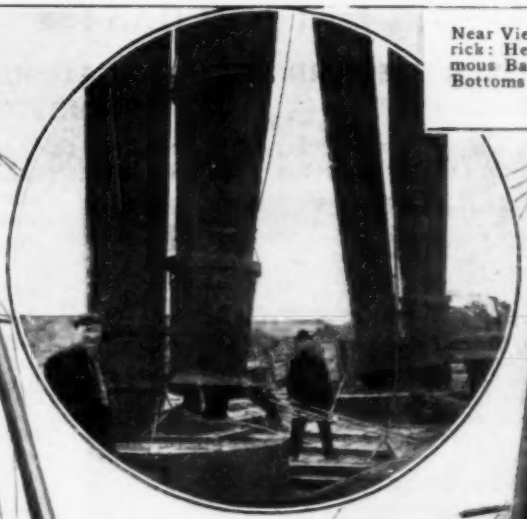
Kings among the giants of the forests were felled to furnish material for the construction of an immense wooden derrick, probably the largest lifting device of its type in the world, which is used in a western-coast shipyard for placing boilers and other heavy fittings aboard launched hulls. Four great fir trees were used. Each one of these was 300 ft. high and 5 ft. through at the base.

Carpenters shaped the logs into tapering masts, 112 ft. 8 in. long, 3 ft. 6 in. in diameter at their larger end, and about 2 ft. through at the opposite end. The four masts were fastened together to make two A-shaped frames, one of which serves as the mast of the derrick, and the other as the boom.

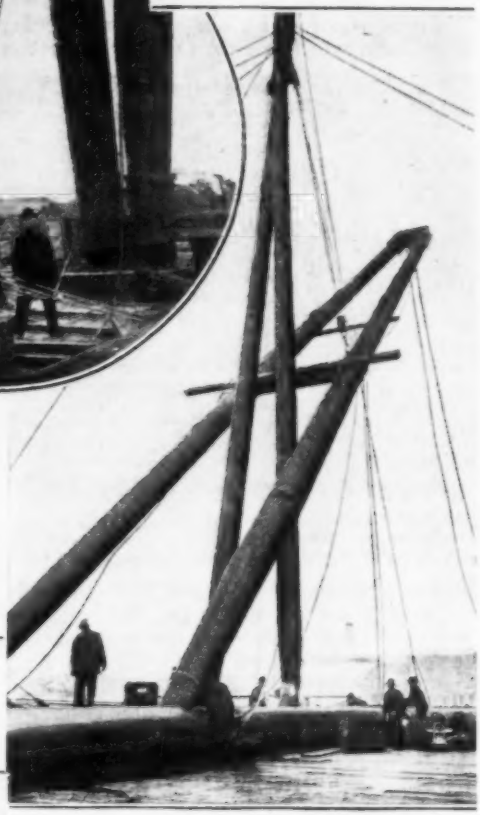
Heavy steel cables guy the lofty contrivance, while two 7/8-in. steel ropes, each 1,250 ft. long, are used for hoisting. A 40-hp. electric motor furnishes power for this and for regulating the position of the boom. Nine piles, lashed and bolted together, form the foundation of the derrick. On this is placed the concrete-filled steel casing on which are mounted the enormous ball-and-socket joints in which are fitted the lower ends of the boom masts. Sixty tons can be lifted by the derrick at a 62-ft. reach.



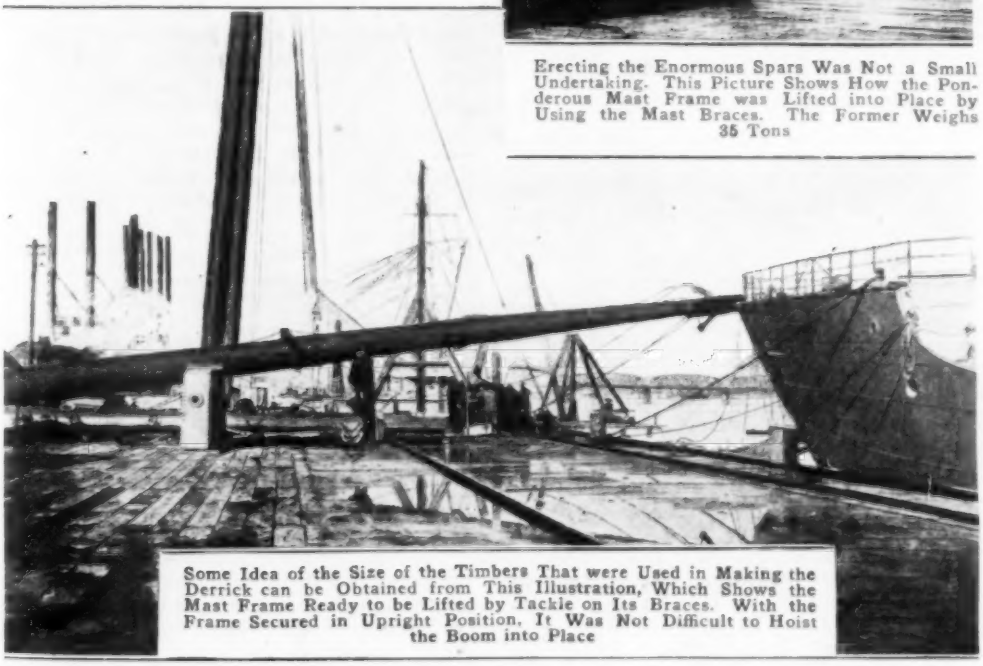
Ready to Perform the Tasks for Which It was Constructed, This Great Wooden Derrick Towers Over 112 Feet into the Air at a West-Coast Shipyard, Where It will be Used for Lifting Boilers and Other Heavy Fittings aboard Launched Hulls. Trees 300 Feet Tall were Felled to Make the Lofty Masts



Near View of the Base of the Derrick: Here can be Seen the Enormous Ball-and-Socket Joints at the Bottoms of the Two Masts Which Serve as a Boom



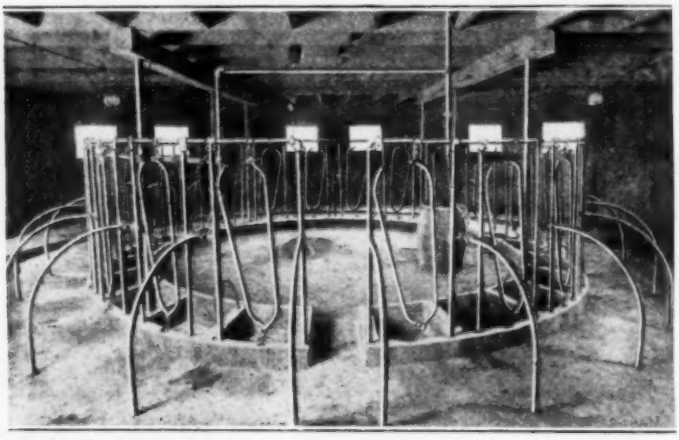
Erecting the Enormous Spars Was Not a Small Undertaking. This Picture Shows How the Ponderous Mast Frame was Lifted into Place by Using the Mast Braces. The Former Weighs 35 Tons



Some Idea of the Size of the Timbers That were Used in Making the Derrick can be Obtained from This Illustration, Which Shows the Mast Frame Ready to be Lifted by Tackle on Its Braces. With the Frame Secured in Upright Position, It Was Not Difficult to Hoist the Boom into Place

CHORES SOON OVER IN ROUND DAIRY BARN

A mid-western farmer owns a circular dairy barn which makes care of the cattle unexpectedly easy. The simple iron stalls are arranged in a circle on the concrete floor. Before each stall, as part of the stone floor, is a feed box. As the feed is dumped into the center of the circle from an upstairs loft, the farmer can thus feed all his cattle with a minimum of effort. A circular drainage "ditch" encourages frequent flushing.



Standing in the Center of This Circular Cow Stable, the Farmer can Feed His Cattle with Ease. The Simple Concrete-and-Iron Construction, Coupled with the Novel Stall Arrangement, Makes for Cleanliness and Order

CHINESE PILGRIM TRAVELS IN UNUSUAL MANNER

Every inch of the road he travels, a Mongolian pilgrim will cover by prostrating himself along the ground. He is journeying from his native province to Lhasa, the Buddhist Mecca, in the hope that the health of his mother will be improved because of his sacrifice. Lying down, he marks the point to which his outstretched hands have reached, arises, puts his toes on that mark, and repeats the process. By this means he travels about six miles a day in level country, and half that distance in the mountains. A leather apron protects his body, and he wears wooden shields on his hands.

¶ Potassium salts have been found in the brine of certain Chinese salt wells, it was announced recently. There are over 1,000 of these wells in one locality, ranging in depth from 1,000 to 3,000 ft., and dug by a primitive method.

STUDY ANATOMICAL STRUCTURE WITH MOTION PICTURES

Inspired by the success of motion pictures as teachers of airplane and engine construction, a British army surgeon has prepared a series of anatomical films which have proved highly valuable in classroom work. In the pictures a complete skeleton is first displayed at all angles, and then begins to disintegrate, the process being slowly continued until the backbone alone is left. The skeleton is then reassembled, each bone being clearly indicated before it takes its place, to impress its form and purpose firmly upon the minds of the spectators. The same investigator has also made film studies of abdominal reflexes of great scientific value.

FARM PRODUCTS ADVERTISED ON NOVEL SIGNBOARD

Fresh farm products are difficult to obtain in city markets. Realizing this, the proprietor of a farm located on a much-traveled road near a large city of the Middle West advertises eggs, butter, and poultry on a novel signboard, and draws many customers from among the motorists who drive that way. A gigantic figure, representing a traffic policeman, is combined with a road map of the vicinity, so that the sign is not only likely to be noticed, but is valuable to drivers who are uncertain about the routes. Moderate prices are asked for the articles sold.

How an Enterprising Farmer of the Middle West Advertises His Products to Motorists, and Assists Them at the Same Time

The British Royal Camel Corps, Operating in the Far-Eastern Campaigns, Formed as Odd a Military Unit as Any That Entered the Great War. It Proved Very Useful, However, in the Territory to Which It was Adapted

DEMOBILIZING THE CAMELS

By GEORGE F. PAUL

WITH the demobilization of the royal camel corps, formed in Asia by the British to fight the central powers, there has disappeared one of the most interesting organizations of the British army. The part played by the war camels during the campaign of El Arish, Magdhaba Rafa, and in the first battles of Gaza, is historic and full of glory for the famous corps. Out of one company that entered battle with 250 camels, only 20 remained alive at the end of the day's fighting. The royal camel corps received most effective aid from the two batteries of camels from Hongkong and Singapore.

The British government has used various types of camels for mounting this corps, the principal ones being the Sudanese and the Egyptian. The Sudanese camel has one characteristic which is of the greatest advantage in campaigning in the desert, and that is its ability to go for seven days without drinking water. The Egyptian camel, on the other hand, cannot go more than two days in hot weather without water.

On Forced Marches through Desert Regions, Where Food and Water were Not to be Had and Provisions could be Packed for the Rider Only, the Military Camel's Peculiar Characteristics Made It Valuable to the British Arms

It is generally believed that the camel is one of the most patient of the beasts of burden, and that it possesses great powers of endurance. This belief is erroneous, for the camel is very delicate in some respects, and unless great care is given it, it cannot endure service for long periods. The most delicate of all is the camel of Hindustan. Nothing is more disagreeable and tiresome than the first days given to training camels of this type. The sudden manner in which they leap to their feet and their peculiar gait make them more difficult to handle than others. They must have their allotted rations at regular intervals. More obstinate than the mule and even wilder, there are certain periods of the year when the camel is a veritable demon; it becomes intolerable from the way that it kicks, bites, and fights with the other camels. The camel is not sure of its footing on ground that is moist and slippery. Then it tumbles around like a person learning to skate.

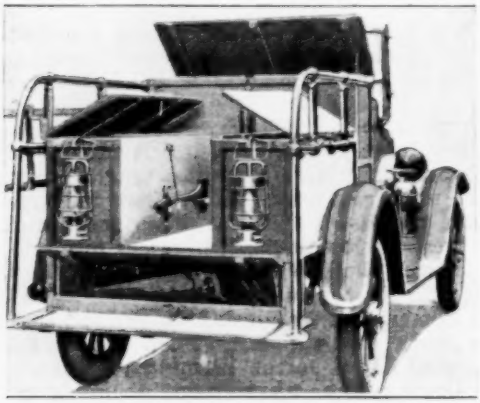
During the operations in Palestine and in the regions farther to the north, the horse proved far superior to the camel, and at times the soldiers of the royal corps were compelled to travel on foot or mount horses, abandoning their arms and baggage. On one occasion it was found necessary to abandon more than 100 tons of materials because the camels could not advance over the bad roads.

However, they repeatedly proved their worth on forced marches through regions where provisions and water were extremely scarce, and they showed their willingness to share the soldier's lot, no matter what it might be. Many of the camels are so light in color that they could not be brought up to the firing line, but on many occasions they have

been exposed to fire and have borne their wounds with stoical fortitude. When the camel drivers went to the trenches, the camels remained back in the second line, but even here they did not always escape the fate of their human companions, for many of them fell victims of shells and gas.

GAS COMPANY'S TRUCKS AID CITY FIRE DEPARTMENT

Illuminating gas greatly increases the danger incident to fires in large cities. Quite frequently pipes containing gas are severed by heat or the collapse of structures, and disastrous explosions result, or firemen or others in the buildings are asphyxiated. Recognizing the fact that fire departments are not provided with sufficient means for coping with this peril, a gas-manufacturing company of Boston has equipped 15 swift motor trucks with materials for rescue and repair work in such emergencies, and these answer fire alarms to supplement the municipal fire-fighting apparatus. The trucks are stationed in different parts of the city so that any location can be reached in a brief time. Two gas masks, a pulmotor, two fire extinguishers, a first-aid kit, ladders, rescue ropes, and an assortment of tools are carried on each truck, which is in charge of a crew of three men.

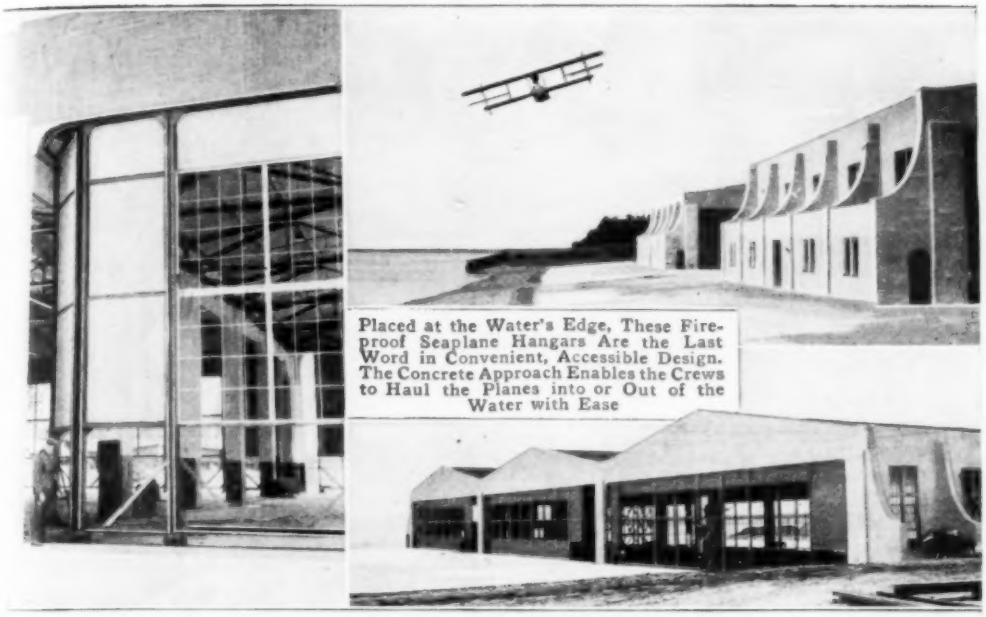


One of Boston's Rescue and Repair Trucks Designed to Lessen the Danger of Illuminating Gas at Conflagrations: A Gas-Manufacturing Company Operates 15 of the Machines

MINNESOTA TOWN VISITED BY VIOLENT STORM

Buildings of strong construction were torn to bits and scattered by a cyclone of terrific violence which swept through Fergus Falls, Minn., in the early summer, killing and injuring many persons. The property loss is estimated to have been $4,500,000. Numerous families were left without homes after the storm, which is considered one of the most destructive in the history of Minnesota, and some of the town's public buildings were left in ruins.

Ruins of the Courthouse and Jail in Fergus Falls, Minnesota, after the Great Storm: Many Persons were Killed and Injured by the Cyclone, Which Damaged Property in the Town to the Extent of $4,500,000. This Picture was Taken Shortly After the Tornado had Passed



Placed at the Water's Edge, These Fireproof Seaplane Hangars Are the Last Word in Convenient, Accessible Design. The Concrete Approach Enables the Crews to Haul the Planes into or Out of the Water with Ease

At the Turn of a Switch the High Steel Doors at the Left Roll Open or Shut, Making It Possible to Isolate Any or All of the Hangars in Case of Fire. The Photograph at the Lower Right Gives a General View of the Construction, Showing How Every Possible Square Inch is Devoted to Window Space So That Interior Lighting will Be Ample for Repair and Construction Work

FIREPROOF SEAPLANE HANGARS BUILT AT WATER'S EDGE

Six seaplane hangars, now nearing completion at a U. S. naval air station, represent a perfection in hangar design that matches the improvements in seaplane construction. Each costs $50,000, and has been planned to give the maximum efficiency in housing and handling naval airplanes. All are absolutely fireproof, being built of concrete and steel. Large windows and skylights give an abundance of natural daylight for mechanical operations on the planes. Motor-driven roller doors of steel and wire glass may be opened or closed by the turn of a switch. Best of all, from a timesaving standpoint, is the location of the hangars. They are directly at the water's edge, with a wide pavement of concrete permitting easy transportation of the seaplanes to and from the water.

MADRID'S PUBLIC LAUNDRIES EQUIPPED WITH BARROWS

When the women of Madrid, Spain, have done their family washings in the city's public laundries, they load the clean clothes into large wheelbarrows and take them to the clotheslines. Though a large space is covered with lines at each laundry, an unoccupied line near the tubs is often not available, and it sometimes is necessary to go a quarter of a mile to find a place to hang the wet clothes. The wheelbarrows are found to be very convenient in such exigencies. A number of the primitive conveyances are kept waiting at all times for the Spanish washerwomen.

Wheelbarrows are Provided at the Public Laundries of Madrid, Spain, for Use by Washerwomen in Conveying Wet Clothes to Lines for Drying

¶ Battling snowdrifts, similar to those which prevented the success of an earlier attempt by an army tank, a five-ton endless-tread tractor recently reached the summit of Pikes Peak.

One of the Floating Salmon Canneries Used in the Northwest: Built on the Scow Is a Complete Canning Plant, with Living Quarters for the Men Required to Operate the Cannery and Care for the Boat

BIG CENTURY PLANTS BLOOM UNNOTICED IN DESERT

Century plants of great height, compared with tub-grown specimens, bloom and die unnoticed in the deserts of the Southwest. After remaining an inconspicuous rosette of thick, green leaves for 30 or 40 years, the length of time depending upon climatic conditions and the character of the soil, the strange plant begins preparations for its long-deferred blooming by sending up a thin, tapering stalk, which often grows to a height of 18 or 20 feet. On this are borne brilliant yellow flowers. Soon afterward the leaves turn purple, and the plant remains practically dead until the next blooming period.

Gigantic Century Plants of the Southwest: In the Picture Above is Shown a Clump of the Tall, Flower-Bearing Stalks. Their Height can be Judged by Comparing Them with the Figure of the Man. At the Right Is a Closer View of a Single Specimen

FLOATING SALMON CANNERIES BUILT ON SCOWS

Instead of bringing fish to canneries, a salmon-canning company which operates in the Northwest sends canneries to the fish. This is done by building a completely equipped canning establishment on a large scow, adding living quarters for the men required to handle the boat and manipulate the canning machinery, and towing the floating cannery wherever the salmon are running heaviest. Three of the unusual craft are now in use. During a season each one of these canned approximately 30,000 cases of fish. Among the features of the living quarters on the scows are shower baths and lounging rooms.

TO TRANSPORT MERCHANDISE VIA HYDRAULIC TUBE

Using a hydraulic tube somewhat as the pneumatic-tube system is now employed, but on a larger scale, a newly organized English concern expects to achieve wonderful results in merchandise transportation. The arrangement contemplates an iron pipe, perhaps two feet in diameter, connecting the traffic terminals, in which containers, about four feet long, buoyed to the specific gravity of water, would carry some 500 pounds of goods apiece. With the containers four feet apart, and the pipe filled with water moving at 10 to 20 miles an hour, a 120-mile pipe would have a capacity of 20,000 tons, or 165 tons per mile. Siphon action would carry the containers over hills and valleys, and even under the Channel.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

SMOKELESS POWDER FROM TREE STUMPS WAR DEVELOPMENT

By E. T. BRONSDON

IF ever again the United States meets with the great misfortune of being forced into another war, one necessary item, at least, will not cost so much to the nation. That item is smokeless powder.

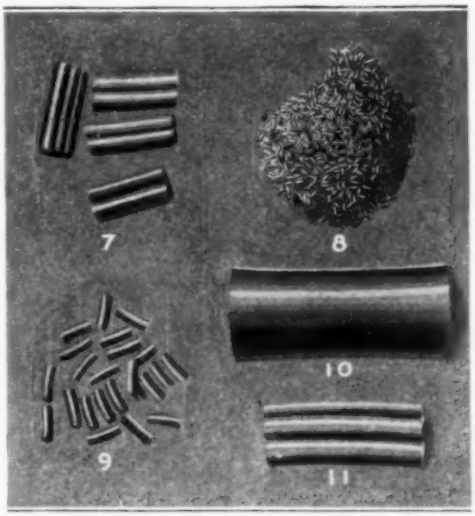
After April, 1917, the price of cotton soared. The country as a whole paid for cotton linters by the thousands of tons. These tangled clippings from the cotton-mill spinning rooms, really nothing but weaver's waste, cost us two and one-half cents a pound. Before the war they went begging at one-half cent a pound. The poorer grades of raw cotton, even, were transformed into linters to supply the demand at this price. Every man, woman, and child in the United States felt the pinch. Each family pocketbook was called upon to purchase dresses, stockings, handkerchiefs, and all other necessary cotton articles at prices that would have purchased silk or linen in 1914. It was one of the hardships of war, and no one complained.

This Expert of the Forest Products Laboratory Proves That Familiarity Breeds Contempt by Lighting a Cigarette from a Burning Stick of Smokeless Powder

The government, however, saw that, if the war continued much longer, the bill for smokeless powder alone would become oppressive, not even considering the bills civilians would have to pay. It called upon the experts of the Forest Products Laboratory at Madison, Wis., to attempt the manufacture of a usable grade of nitrocellulose from wood. Nitrocellulose (more properly cellulose nitrate) is the basic substance from which is made the smokeless powder used in every army rifle, and all machine guns, mortars, fieldpieces, and land and naval heavy artillery. Corn pith was mentioned as a possible alternative for wood, if the latter material did not "prove up."

Immediately a series of experiments with many varieties of wood was begun. Within two months the laboratory announced success, and nitrocellulose that could be made into smokeless powder was shipped to Washington for official test.

The first exhaustive tests resulted in the new material being turned down. The laboratory experts had been handicapped by an entire lack of specifications or data on the requirements their nitrocellulose had to fulfill. It was found that their first batch was very dark in color, while that made from cotton linters was almost white. For some reason it proved to be the case that dark-colored nitrocellulose was not easy to handle, and the powder made from it not sufficiently stable. The experiments were resumed.

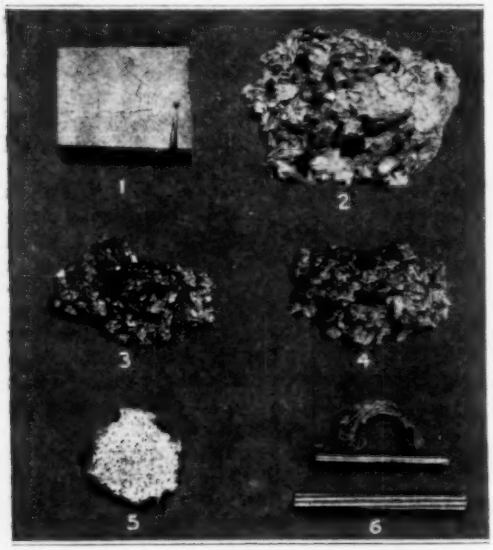


For Different Purposes Smokeless Powder is Prepared in Different Forms. Number 7 is Intended for the 12-Inch Mortar; 8, for an Army Rifle; 9, for the 75-Millimeter Gun; 10, for the 16-Inch Naval Gun, and 11 for the 12-Inch Naval Weapon

Three weeks later unimpeachable results were obtained. Not only had the laboratory succeeded in producing a light-colored nitrocellulose from wood, but the experts had found means for stabilizing the darker material and making it just as satisfactory. Government tests on an extensive scale confirmed these results.

The processes involved were simple.

First, the paper pulp was made from the chipped and purified wood—usually jack pine, although other woods were found suitable—and then this was treated with



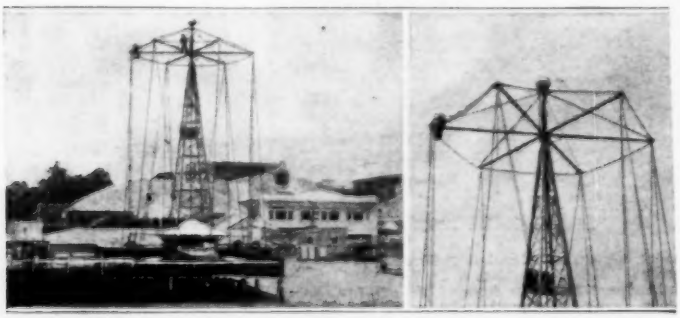
To Effect the Transformation from Pine Wood to Explosive, the Block at the Upper Left is Pulped, Subjected to Nitrating Acids, Washed, Mixed with Ether and Alcohol, and Finally Made into "Macaroni," as the Finished Product is Called

nitric and sulphuric acids for the purpose of nitration. After "digesting the acids," the pulp went to a steel centrifugal wringer; then it was wrung again, to remove the last traces of acid, and lastly the mass was thoroughly mixed and softened with a solution of ether and alcohol, both solvents for nitrocellulose, and placed in a machine where it was made into "macaroni." This actually is the name given to smokeless powder in its final stage, as it is pressed through perforated plates just like the sticks from which the Italian national dish is prepared. In the smokeless powder even the fine stalks, about the size of spaghetti, used in the cartridges of army rifles have a hole the full length to make the burning quicker and more even. In the larger canes many such holes are provided.

One conclusion reached by the Forest Products Laboratory in respect to the manufacture of smokeless powder by this means is almost as worthy of notice as the achievement itself. For raw material pine stumps are probably best. The laboratory recommends that this powder be made exclusively from the stumpage on waste land in the South. The price paid for the stumps when delivered—from one to two cents a pound—would actually yield a small profit to the land owner clearing his land in this manner; millions of acres of deforested land in the South, which heretofore has lain uncultivated because of the cost of removing stumps, thus would be thrown open to agriculture, and at a profit. At a time when the world needs every pound of food that can be grown, and every yard of cotton that can be woven, this recommendation should be given the most serious consideration.

SAILORS EMPLOYED TO MEND RIGGING ON "AERIAL RIDE"

The proprietors of an amusement park were recently confronted by the task of repairing the upper rigging of the popular "aerial ride," in which the passengers are whirled about a high central tower. A number of workmen were known to have the skill required for the job, but none cared to venture so far from the solid earth. So the proprietors applied at a near-by naval station, and were soon supplied with two newly discharged sailors who considered the job child's play.



Local Workmen Refused to Repair the "Aerial Ride" at the Left; So the Proprietors of the Amusement Park Hired Two Discharged Sailors for the Job. Despite the Danger of the Work, Seen at the Right, It Was Play to the Two "Gobs"

¶The Danish ministry of traffic is working out a plan for the erection of a great radio station at Copenhagen for direct wireless communication with the United States.

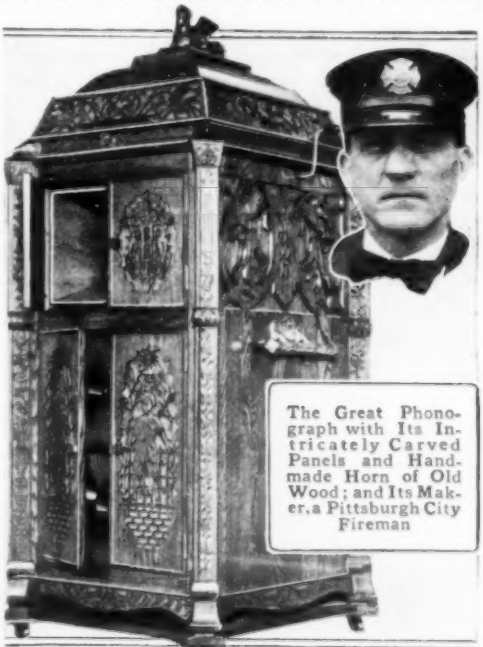
When This Remarkable Photograph of the Deck of the Steamship "Western Knight" was Taken, the Vessel was Near Foundering on Its First Voyage. Too Low Ventilators Admitted Water to a Hold, Causing a List That Placed the Ship at the Mercy of the Waves

STEAMSHIP'S MAIDEN VOYAGE TURNS OUT DISASTROUSLY

Encountering a storm of unusual violence 200 miles off Cape Flattery, the recently completed steel steamship "Western Knight" nearly foundered on its initial voyage from Puget Sound, and was forced to return to port. An investigation disclosed that the unfortunate experience was due to the low position of the vessel's ventilators, into which the high waves dashed, flooding one of the holds. This caused the ship to list heavily. In this position the steamer fought a losing battle with the sea, until it became evident that disaster would result if the voyage were continued. The "Western Knight" is an 8,800-ton craft and was built for the United States Shipping Board.

ELABORATE PHONOGRAPH BUILT IN FIREMAN'S SPARE TIME

A remarkable phonograph, standing five and a half feet high and ornamented to the taste of an Indian rajah, is the finished product of a Pittsburgh fireman's spare time for three years. The machine weighs 300 lb., and the cabinet is made entirely of hand-finished chestnut wood. Intricately carved designs embellish all the panels, and behind the fretwork of the canted corners are long, narrow mirrors; while at the very top is perched a small, but finely wrought, sphinxlike image. The curved horn inside is built of laminations cut from wood

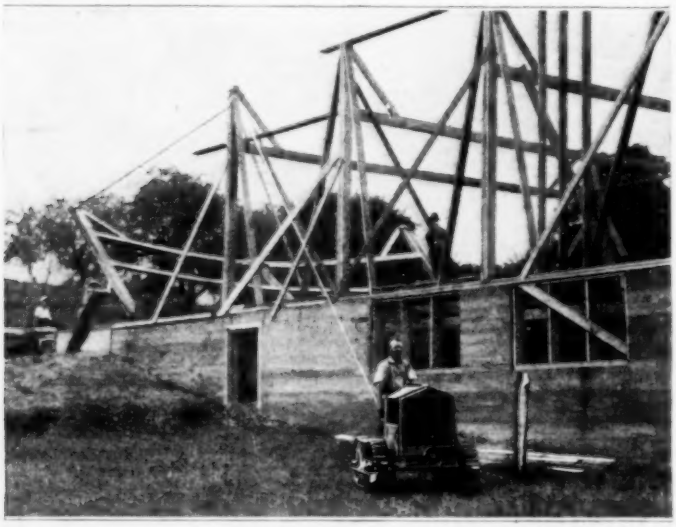


The Great Phonograph with Its Intricately Carved Panels and Handmade Horn of Old Wood; and Its Maker, a Pittsburgh City Fireman

75 years old, each layer coated with lamb's wool. Most of the work was done at the fire-engine house.

FARMER MAKES TRACTOR HELP TO BUILD HIS BARN

Many farmers have discovered, with characteristic ingenuity, that a tractor may be made to serve other purposes than merely pulling a plow. The owner of a New Jersey farm recently completed a large barn, the framework of which was erected almost entirely by tractor power. The heavy beams were hoisted into place by passing a rope through a block and tying the end to the tractor, which, instead of winding it on a winch, simply ran across the field with it, completing the job in a hurry.



Erecting the Framework of a Large Barn with the Help of a Tractor, by the Simple Method of Tying a Rope on the Machine and Then Running It the Proper Distance to Hoist the Beams

NEW YORK POLICE EXPERTS TO X-RAY ALL BOMBS

In a basement room of New York City police headquarters is to be installed an X-ray apparatus for the examination of all bombs received by the department. Any person living in New York who receives a bomb, or something he believes to be a bomb, will communicate at once with the police. The suspected object will be rushed to the testing chamber, and there subjected to the X-rays by members of the "bomb squad" acting with experts from the U. S. Bureau of Mines. As a result of this safer and more scientific examination, the "bomb squad" hopes to obtain valuable clues to the origin of these infamous weapons.

HYDROELECTRIC POWER PLANT FOR CANADIAN CITIES

Electrical energy will be furnished the Canadian cities of Fort William and Port Arthur by a dam and power plant being constructed at Cameron Falls, on the Nipigon River, by the Hydroelectric Power Commission of Ontario. The project will cost about $3,500,000. Water will be impounded by a dam 30 ft. high. At the beginning, only two units, capable of developing 10,000 hp. each, will be installed, though the possibilities of the construction are 70,000 hp., requiring additional generating units. The current will have a force of 6,000 volts as it comes from the dynamos, but will be raised to 110,000 volts for transmission. Before entering the cities, approximately 70 miles away, it will be lowered to 22,000 volts. For actual use it will be reduced to 2,200 volts.

PRIMITIVE SUNDIAL USED BY MEXICAN INDIAN

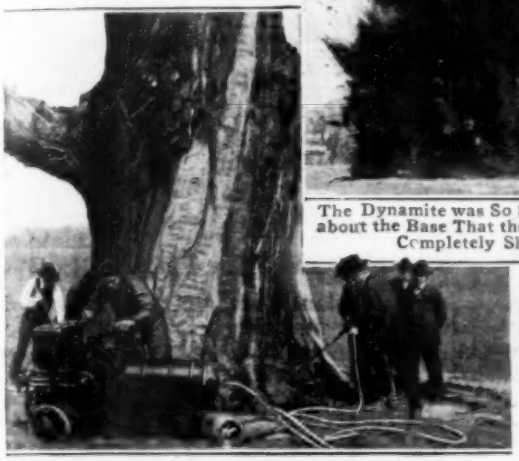
While not as exact in the information it imparts as a jeweled watch, a sundial of very primitive construction, discovered in Mexico by an American engineer, serves satisfactorily as a timepiece for its owner, an Indian woodcutter. It was made by nailing the circular bottom of a tin lard pail to the side of an inclined post, then driving a long spike a short distance into the post through the center of the disk. The shadow of the spike indicates the flight of time, measured by scratches on the tin disks.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

HUGE TREE HUMBLED BY FEW POUNDS OF DYNAMITE

Government forestry officials recently gathered on a Pennsylvania farm to watch an expert destroy a famous chestnut tree, known as the largest of its kind, and, except for the redwoods of California, as the largest of any kind in the United States. Three to four hundred years old, the tree had developed the enormous girth of 34 ft. 6 in. But the expert set out to show that the slow work of centuries counted for nothing in the face of a little well-placed dynamite. So, with a mechanical drill, he quickly bored 24 holes around the base, filled them with 110 lb. of dynamite in 220 cartridges, and retired to his detonating switch 600 ft. away. A motion of the handle threw the old giant high into the air.

The Dynamite was So Skillfully Placed about the Base That the Huge Tree was Completely Shattered

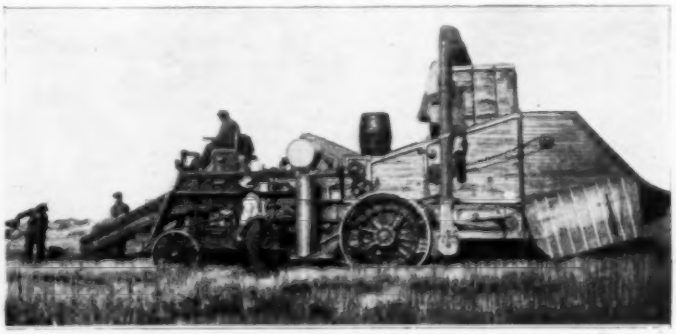


With This Compressed-Air-Driven Auger the Expert Drilled 24 Holes about the Base of the Tree. In These He Placed 110 Pounds of Dynamite in 220 Cartridges

Forestry Officials are Examining the Venerable Chestnut Tree Before the Dynamiting Commenced. The Tree Was the Largest of Its Kind in the United States

AUTOMOTIVE THRESHER GOES FROM SHOCK TO SHOCK

A threshing machine which does not require the wheat to be brought to it, but goes through the field from shock to shock, is used by some of the large wheat growers of western Canada, having been invented by an Alberta man. An automobile motor propels the machine, one man driving and another operating the thresher. Four field men pitchfork the sheaves onto the conveyor which carries them into the machine, and the work progresses very rapidly. The consequent saving of time is an important factor in the enormous wheat fields of the West.



This Canadian Threshing Machine Has an Automobile Motor, and Travels about the Wheat Field, Threshing as It Goes. It Uses Two Men, One to Drive and One to Operate

HANDS USELESS, ARTIST HOLDS BRUSH WITH HER TEETH

About a portrait of himself, lately sent to President Wilson, clings the pathetic and inspiring story of the 19-year-old

Daily for More Than Two Months This Plucky Little Artist Worked on Her Portrait of President Wilson. Lacking the Use of Her Hands, She has Schooled Herself to Wield the Brush in This Way

artist, so crippled by rheumatism that she paints with the brush held between her teeth. Every afternoon for more than two months her family placed the paint box, cup of water, and brushes on a table before her. Laboriously then, performing every operation with her teeth, she mixed the colors and proceeded with her work on the portrait. Until a year ago she was able to work at her beloved art in the normal way, despite her affliction. Then an automobile accident injured her hands, threatening to deprive her of even that solace. But her eagerness for the brush sustained her during months of tedious and discouraging practice with her teeth, until now she can point with modest but just pride to the unique portrait as proof of her success.

BRITAIN BUILDING WORLD'S LARGEST DIRIGIBLE

The construction of a great dirigible that will carry six airplanes for its own protection is said to have been begun by the British government. When finished, in 18 or 20 months, the craft will measure 1,100 ft. long and 137 ft. in diameter, giving a capacity of 10,000,000 cu. ft. and a lift of 200 tons. It is computed also that the cruising radius will be 16,000 miles, or enough to make the long journey from England to Australia a performance of no particular difficulty.

MISSISSIPPI TOURED BY NAVY SEAPLANES FOR FIRST TIME

Navy seaplanes flew up the Mississippi River a few weeks ago for the first time in history. As part of a large flotilla which embodied almost every type of craft and instrument used in antisubmarine warfare, they visited city after city. Each was "bombed" in turn with clouds of literature about the navy and the advantages of enlistment. Unconditional surrender usually followed, with a dinner to the airmen and the ships' officers. The cruise was made for the purpose of interesting the river cities in navy life, and thus stimulating enlistment.

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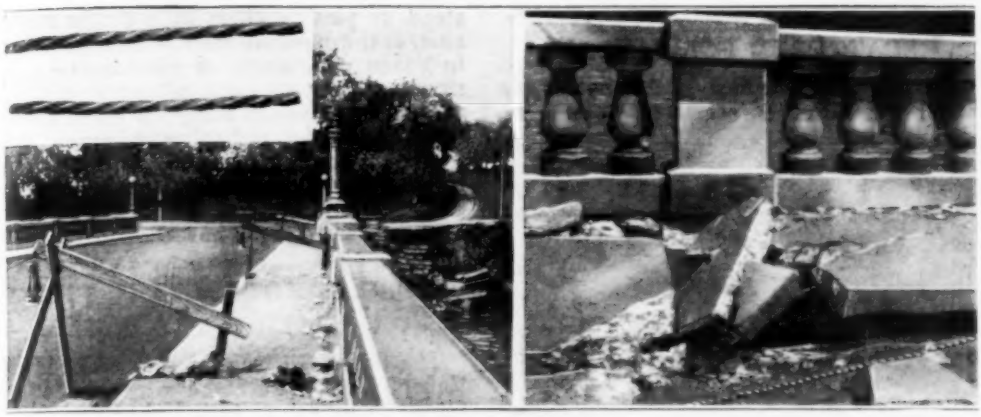
Navy Seaplanes Flew up the Mississippi River Recently for the First Time. The Three Planes are Here Moored to the Old Levee at Memphis, Tennessee, Where They Form an Interesting Contrast to the Traditional River Boats in the Background



On the Left Is a General View of the Shattered Section of the Bridge, and at the Right the Sidewalk and Railing Separated by the Bolt. The Insert Pictures Two Stretched Reinforcing Rods

LIGHTNING DAMAGES BRIDGE OF REINFORCED CONCRETE

Some unexpected results were produced when lightning struck a reinforced-concrete bridge across the Iowa River, at Iowa City, and damaged the structure to the amount of several thousand dollars. One of these was the complete separation of a concrete sidewalk, built along the side of the span, from the bridge itself. The massive side rail contiguous to the walk was moved a noticeable distance toward the edge of the bridge, while the sidewalk was shoved in the opposite direction, and cracked across in several places. The damage extended along a section 100 ft. long. As a result of this shifting, many of the ½-in. twisted-metal rods which bound the side rail to the bridge were torn from the concrete in which they were imbedded, broken in two, and the pieces dropped into the conduit beneath the sidewalk. When recovered these were found to have been reduced to ¼-in. rods through stretching.

MEXICO HAS OIL WELL CAPPED WITH ICE

About 14 miles south of Tampico, Mexico, there is an oil well whose casing head is caked with and surrounded by ice to the extent of several tons. Even the derrick floor is covered with it. The oil and gas, when encountered at a depth of 3,000 ft., shot upward with a pressure that threw the drills and casing hundreds of feet in the air. Now the gas leaking out around the heavy gate valve, through the sudden expansion on its release, absorbs so much heat that all surrounding moisture is frozen. The refrigerating process is exactly like the familiar action of liquid air, carbonic acid, or ammonia gas.

The Coating of Ice about the Casing Head of This Mexican Oil Well Is Visible in the Center of the Picture. It is Caused by the Refrigerating Action of Expanding Gas

¶ Thousands of discharged soldiers and sailors are now receiving farm training through the summer courses arranged for them by practically all of the colleges of agriculture in the United States.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

HIGH-EXPLOSIVE DETONATORS SCATTERED FOR SAFETY

Storing high-explosive detonators in small quantities at scattered points, instead of placing them in a single magazine, is the method used at naval stations to lessen the danger of disastrous explosions. A few caps are placed in each of a number of boxes hung on the walls of offices, barracks, and other buildings. The boxes are painted a bright red, and labeled to prevent tampering. Should the contents of one of the boxes explode, it would do no serious harm.

One of the Boxes in Which are Stored a Few of the Detonators Constituting a Naval Station's Supply is Shown Hanging on the Wall behind the Officer

UNUSUAL HOT-WATER SYSTEM FOR HEATING TOWN HALL

The town hall in a large city of central Europe is being heated with hot water piped from an electric-light plant half a mile away. Live steam at 648° F. and 28-lb. pressure is used to heat the water to 275° F. At this high temperature a pipe only seven inches in diameter is adequate. The return pipe is of the same size, and a third pipe is installed as an emergency reserve for either delivery or return. The pipes are laid in a concrete subway, each with a two-inch coat of insulation, and the waste space is utilized for electric wires. At the radiators, the superheated water is tempered to 194° by pumping in a percentage of cooler water from the return pipe. The temperature of each part of the building is registered and controlled at the engine room.

COMPLETELY EQUIPPED SHOP CARRIED ON ARMY TRUCK

For making repairs to the ordnance equipment of soldiers in the field, an army truck has been transformed into a mobile repair shop by the ordnance corps. Among other equipment, there are two power machines mounted on the truck, one for sewing leather and other heavy material, and one for lighter work. A vise and a riveting machine also are

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Many Stationary Repair Shops Have Not as Much Equipment as This One on Wheels. Two Machines, a Vise, a Riveter, and Many Drawers and Bins Are Features

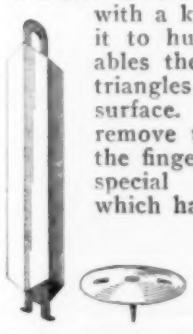
provided. Drawers and bins hold tools and supplies. The sides and end of the body of the truck are hinged to allow lowering to a level with the floor, thus giving workmen more room.

LARGEST MOVING PICTURES SET DISTANCE RECORD

Two moving-picture records were broken recently, it has been asserted, at the centenary celebration of the Methodist church in Columbus, Ohio. An ordinary projecting machine, equipped with a special lens, a special, rapid shutter, and a 150-ampere light, was used to throw pictures, 100 ft. by 75 ft., on a screen 350 ft. away from the machine. These are believed to be the largest animated pictures ever shown, and the distance they were projected also is said to establish a record. The light employed was three times the strength of those commonly used. It generated so much heat that it was necessary to operate the cinematograph at great speed to prevent burning the film. The screen on which the pictures were thrown was 115 ft. square.

NEW THUMB TACK AND LIFTER AID IN DRAFTING

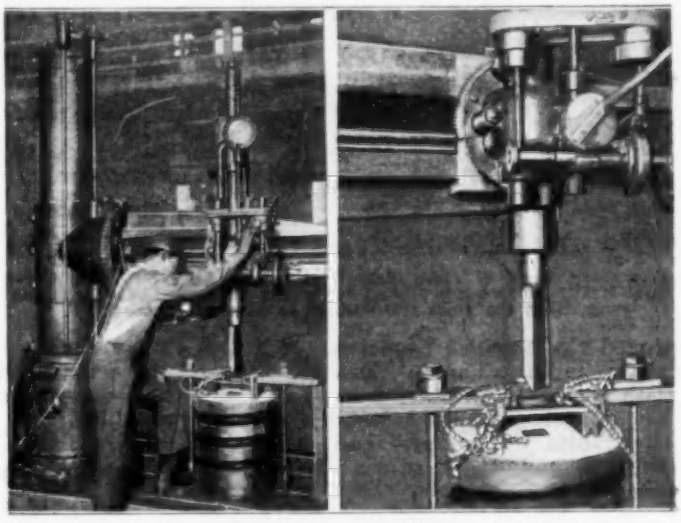
An improved thumb tack for the use of draftsmen has a head that is provided with a knife-edge, which permits it to hug the paper. This enables the T-square and drawing triangles to slide easily over the surface. It is not necessary to remove these tacks by inserting the finger nail under the edge, a special lifter being provided, which has two spring claws that fit in holes in the top of the tacks.



¶ Flies caught in traps owned by the city at Redlands, Calif., are sold to a near-by fish hatchery as fish food. Trucks carry millions of them to the hatchery daily.

IMPROVED FORM OF DRILL CUTS SQUARE HOLES

Added to the growing collection of odd tools is a new form of square-hole drill, devised by the superintendent of an eastern shipyard's machine shop. The drill itself is triangular in shape, with its sides hollowed out to give three cutting edges. While the drill is revolving, its axis is made to travel in an orbit whose course is elliptical. This movement is not now automatic, but could, the inventor declares, readily be made so if quantity production made it desirable. The drill cuts a clean and accurate square hole, which needs no subsequent tooling, even in the corners. While used so far only for three-inch holes, it is stated that a six or even eight-inch cut is within its capacity.



At the Left the Square-Hole Drill is Seen Working in a Press, the Close-Up View at the Right Showing How It Operates through a Guide, Which Steadies the Orbital Motion Imparted by the Chuck

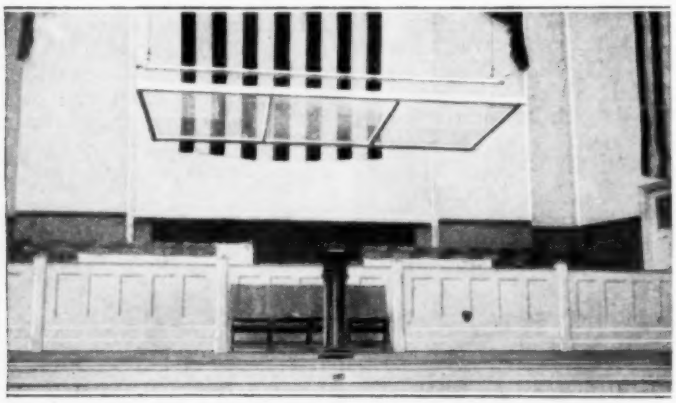
NAVY PLANS GIGANTIC AIRSHIP HANGAR FOR ATLANTIC COAST

The secretary of the navy has approved plans for the erection at Lakehurst, N. J., of a tremendous dirigible hangar, to be of steel throughout, and 800 ft. long, 265 ft. wide, and 174 ft. high, with provision for additional sections as required. The designers are evidently looking far into the future, as a shed of these dimensions will shelter a dirigible of 10,000,000-cu.-ft. gas capacity. It will be remembered that the transatlantic dirigible "R-34" holds 2,000,000 cu. ft., or only one-fifth as much.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

USE GLASS SOUNDING BOARD IN CHURCH AUDITORIUM

Plate glass was used in the construction of a sounding board that has improved the acoustic properties of a Detroit church. Three panes of heavy glass are set in an oblong frame of steel, which is attached to a wooden pole by wires from its corners, and suspended over the pulpit by cables fastened at either end of the pole. The cables pass through pulleys on the ceiling, permitting the contrivance to be raised or lowered to suit different speakers or conditions. The frame and pole are painted to harmonize with the woodwork of the room.



A Sounding Board of Plate Glass That is Used in a Detroit Church: Three Heavy Panes, Set in a Steel Frame, are Suspended over the Pulpit, and Throw the Voice of a Speaker to All Parts of the Room

MOVE TO PERPETUATE PUBLIC USE OF NAVAL WIRELESS

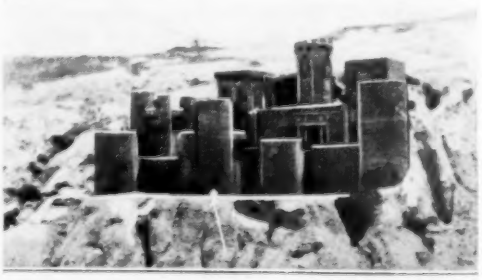
Use of the Navy Department's wireless system for commercial purposes is proposed in a bill introduced by the secretary of the navy. The emergency legislation which has temporarily allowed such use is about to expire. The government's vast radio facilities, supplementing the already overcrowded cables, would prove a tremendous business asset to the country in the building up of foreign trade. The navy has eight transmitting and receiving stations on the Pacific coast, four on the Atlantic, two in the Hawaiian Islands, and one each in the Philippines and Guam. The range of the system is from Italy and all of western Europe to China and eastern Siberia, working directly with the high-power stations in foreign countries.

COAL-MINE WINDING MACHINE HAS INTERESTING CONTROL

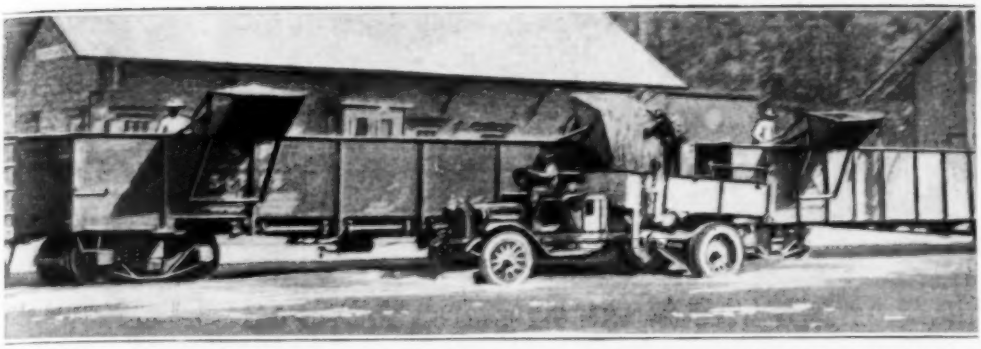
Electrical winding machinery recently installed for operating the cage of a large English coal mine has some control features of marked interest. The 370-hp. alternating-current motor, driving the 15-ft. drum through a 10-ft. spur gear, is controlled by a liquid rheostat through which electrolyte flows continuously. Resistance is changed by raising or lowering a sluice gate, the gradual replenishing of the liquid when the gate is raised assuring a safe rate of acceleration for the motor. A small direct-current generator, chain-driven from the motor shaft, operates a relay through step-by-step resistances if the drum accelerates too fast, and throws the main circuit breaker, stopping the machine.

MINIATURE CASTLE CARVED FROM SOFT SANDSTONE

Carved from soft sandstone, a miniature medieval castle on a California beach faithfully represents a feudal fortress on a small scale. The model building stands on a diminutive hill that strikingly resembles the precipitous elevations upon which such strongholds usually were built. Several styles of architecture are to be seen in the small castle, which was fashioned on a scale of ¼ in. to 1 ft. by a mechanical engineer who spent his leisure moments on the task.



Miniature Medieval Castle, Carved in Sandstone on a California Beach: The Watch at the Bottom of One of the Towers Indicates the Model's Size



Tilting Hoppers for Railroad Gondolas: One is Shown Delivering Gravel into a Motor Truck, While That at the Left is Filled and Ready for Dumping. The Hoppers Are Removable

TILTING HOPPERS ON CARS LOAD TRUCKS RAPIDLY

Tilting hoppers attached to the edges of railroad gondolas are used in some parts of the West to expedite the transfer of gravel from the cars to motor trucks. The hoppers are filled with hand shovels and dumped into the truck bodies when the machines are driven alongside the track. This method prevents loss of time by providing loads for trucks as soon as they arrive at the cars. When a car has been emptied, the hoppers can be removed and fastened to one that is filled.

SWAMPS IMPEDE BUILDERS OF CONCRETE AQUEDUCT

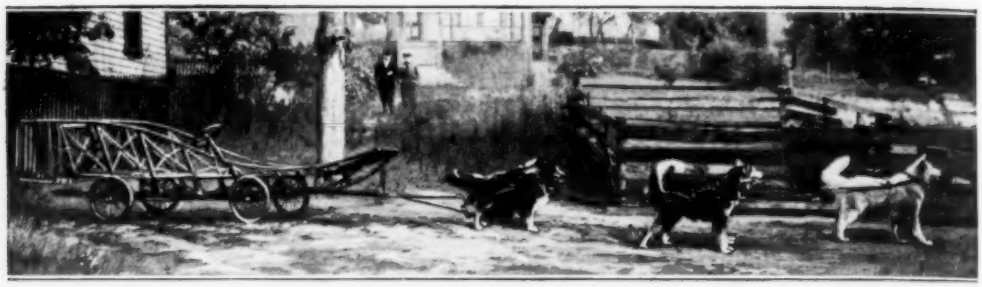
Many difficulties were encountered by the builders of a recently completed concrete aqueduct from Shoal Lake to Winnipeg, Canada, a distance of 97 miles through territory consisting largely of swamps. At some points the ground was so soggy that the ditch, which was dug to receive the enormous pipe, would cave in if excavated material was placed near the edge of the cut. In such cases, two excavating machines were used, one for digging and the other for picking up excavated material and depositing it at a distance from the ditch. Where the water-soaked soil in the bottom of the cut was found too soft to bear the weight of the aqueduct, piles were driven through it, to a more solid stratum, and cut off close to the surface to provide a firm foundation.

¶The Canadian Air Board prohibited trick, exhibition, or low flying over city areas just a few days before the Chicago dirigible disaster.

COMBINED DOOR AND LADDER LATEST SILO IMPROVEMENT

Greater speed in feeding, better and more certain ventilation, and increased ease of operation are advantages of a silo door recently put on the market, according to its manufacturers. Each door is of standard size and swings on two heavy, malleable-iron hinges, shaped so as to clear the door by 7 in. and set 15 in. apart. These form a ladder, up which the farmer may climb to open any section or sections. Opening is accomplished by one simple operation. A rigid frame and a positive-locking device makes the door air-tight when closed. The ladder is particularly valuable in cold weather, when ice makes the ordinary type extremely dangerous.

Opening a Section of the Combination Silo Door and Ladder



When There Is No Snow on the Ground, an Alaskan Hitches His Dog Team to This Wheel-Mounted Sled and Rides on Rubber Tires. The Sled Is One of the Type Used by Indians

WHEEL-MOUNTED DOG SLED USED BY ALASKAN

Snow and ice are not perpetual in Alaska, popular belief to the contrary, and while dog sleds are commonly used during the colder months, they are of no value in the summer, when the ground lacks its covering of white. This latter fact led a resident of the territory to invent a conveyance to be drawn by his dog team during the warm season. A sled of Indian design was mounted on four small bicycle wheels, and a steering column and wheel from an automobile were connected to the front pair. Five dogs, hitched in the usual manner, draw the wheel-mounted sled.

SEAPLANE TAKES REPAIRMEN TO MEND BROKEN WIRE

A seaplane was used in the Panama Canal Zone recently to take repairmen to the scene of a break in a telegraph line on the isthmus. This swift means of travel made it possible to resume communication in a brief time. Carrying two army officers, the plane flew from Balboa, near the city of Panama, to San Carlos, a town 50 miles away, in 45 minutes. The officers located the broken wire in San Carlos, mended it, and then returned to Balboa in 40 minutes. It would have required three days to make the trip in the usual way, which is by horse.

WATER EXCAVATES RESERVOIR AND CARRIES AWAY DIRT

Directed by man, water is digging a large reservoir in Kansas City, and besides is carrying away the earth excavated and with it filling a small lake that is considered undesirable. The site of the reservoir is in a municipal park near the edge of a high cliff, at the base of which is the lake. Streams from two 3-in. fire hose are played, 24 hours a day, on the area set aside for the reservoir, and the material loosened in this manner is carried suspended in the water to the lake by a 6-in. pipe. By using this method, the contractor doing the work avoids damaging the improved roads in the vicinity by heavy hauling, which would be necessary if the excavated dirt were taken away in wagons. The lake which is being filled has been the scene of numerous suicides.

Hydraulic Excavating: Streams of Water from Fire Hose were Played on the Site of a Reservoir as Shown in the Two Pictures on the Right. On the Left Is the Lake Which is Being Filled with Excavated Material

CURVED BACKGROUND FOR STUFFED-BIRD PICTURES

Many of the most educative and striking bird pictures are made by photographing stuffed birds against a cleverly painted, curved background. Museums of natural history use habitat pictures made in this manner, in many instances finding them more satisfactory than those from life itself. The foundation for the background is formed by a large canvas painting, curved back sharply at the ends, so that the group will photograph in proper perspective. Carefully assembled before the painting are shrubs, grasses, mosses, or other growths, all selected only after study of the flora peculiar to the region represented. Thus any number of birds may be shown in any desired positions, and amid surroundings that are both true to nature and ingeniously disposed to display the specimens to best advantage. In this way the settings seem more satisfactory than nature, giving the student time for unhurried inspection, and rewarding the photographer with excellent nature pictures.

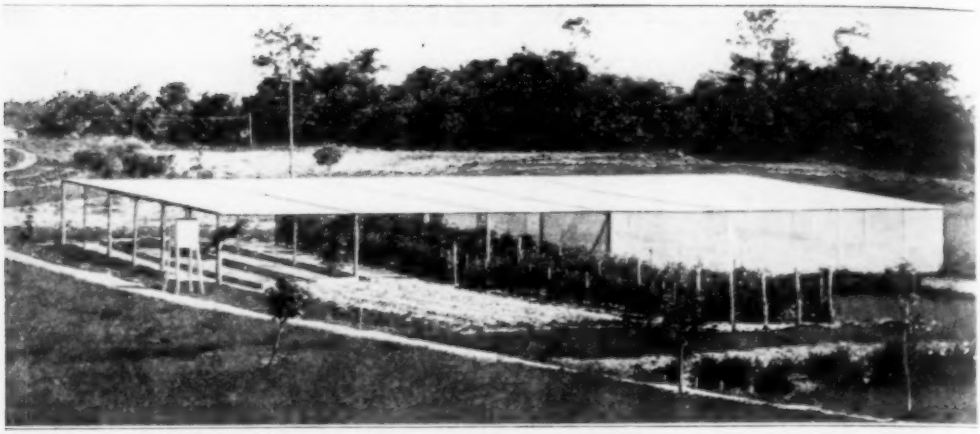
An Egret Rookery from South Carolina: The Curved Background Is Responsible Here, Again, for the Perfect Perspective of the Picture

By Skillfully Blending the Objects of the Foreground with the Curved, Painted Background, This Stuffed "Road Runner" from Arizona is Given a Setting That Rivals Nature. The Curved Background Is Largely Responsible for the Illusion of Reality

MAKE CELLULOSE SUBSTITUTE FROM TREATED GELATIN

A new French process of treating gelatin, or glue, produces a substance with all the plastic and coloring properties of the widely used cellulose products, but entirely noninflammable and odorless. The gelatin, or glue, is melted in a water bath at 194° F., and to it is added a mixture of hop-flower decoction and oxalic acid, which precipitates impurities and gives flexibility to the material. It is then dried in sticks or sheets, dyed any color desired, and soaked in a solution of formaldehyde, alcohol, water, oxalic acid, tannin, and glycerin. After drying in hot air, it is ready to be worked into articles of imitation ivory, tortoise shell, horn, or amber.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.



This Wire Caging Supplants the Old-Fashioned Scarecrow in Keeping the Birds from a New Species of Wheat Developed at a Government Experiment Farm. Bred from a Hardy Siberian Species and a Luxurious American Strain, This Crossbred Wheat Is Typical of the Made-to-Order Products of the Farm. Such Work Promises to Save the American Farmer Millions Each Year

CROSSBRED FRUITS AND GRAINS DISEASE-PROOF

By ROBERT H. MOULTON

IN Alexandria County, Va., across the Potomac from Washington, is located a 400-acre government experiment farm where many wonderful things are being accomplished. It is one of the largest highly specialized farms in the world and is operated by the Bureau of Plant Industry of the Department of Agriculture. The latest thing to draw attention to this farm is the announcements, by the scientists working there, that there has been discovered, or rather produced through crossbreeding, a wilt-proof tomato. This is of great importance, because, be it known, there is a mysterious disease called tomato wilt, which has done untold damage in regions where tomatoes are specially cultivated. The toll from this disease in Georgia last year was 50 per cent of the crop, while Virginia's and Maryland's crops were cut by 10,000 and 25,000 tons, respectively.

At the government farm, however, there was a field of tomatoes which defied every attack by the wilt. The plants in this field were repeatedly subjected to contact with diseased plants brought from other parts of the country for that purpose, and not one of them was affected in the slightest. From this field, therefore, was gathered a goodly supply of tomato seeds which will be sent to all the principal tomato-growing sections. The result, it is confidently predicted, will be the ultimate eradication of the disease and the consequent saving of millions of dollars to the tomato growers of the country.

Sometimes the scientists at the experiment farm can find a cure for a plant disease. If they cannot, they seek a plant which will resist the disease, and then, through the mixing of varieties, evolve a seed which will produce bountifully and at the same time be immune to the disease. This was the case with the tomato experiments. Cures were sought for the tomato wilt. This involved a long and exact process, for the wilt germ first had to be isolated and then efforts made to control it by chemical sprays. As these efforts were not successful, search was begun for a plant that would resist the disease. After a long time such a plant was found.

This plant, however, yielded but a single scrawny tomato, which had nothing to recommend it but a magnificent constitution. Therefore it was decided to mate the hardy but otherwise unprepossessing tomato to an aristocrat of the same family from another section, noted for its prolific yield. This was done, and after several years of progressive experimenting with the progeny of this, the wilt-proof tomato has been evolved.

Another promising example of crossbreeding is that of a variety of Siberian wheat with a strain from our own West. The Siberian wheat possessed the quality of superb vigor, built up through centuries of resistance to extreme cold, and the western beauty that of abundance but the disadvantage of susceptibility to cold. Through this experiment it is expected that there will be evolved a new wheat which will combine the best qualities of both parent wheats.

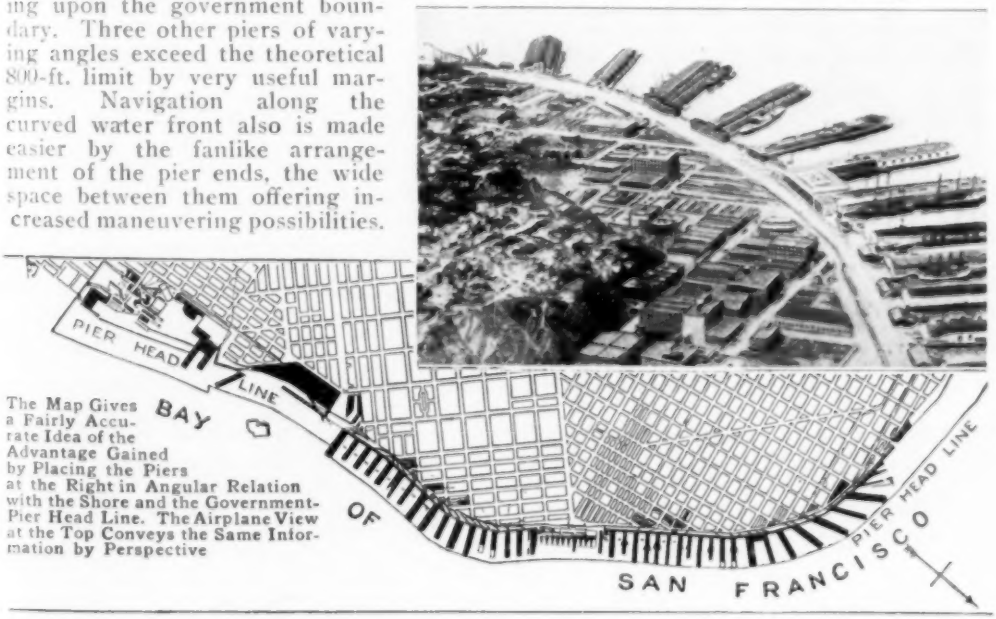
While all this sounds simple enough, it is in reality a long, tedious, and usually costly process. In the case of the two

wheats, the expense of mating, including the succeeding tests, has amounted to $10,000. Of course, this price will be cheap enough if the final results are as anticipated. The progeny of the Siberian and western wheats is considered so valuable that, during the growing season, it is placed in a cage for protection from birds. The cage is of wire netting, with a headroom of eight feet, so that the cultivator can move about.

Some idea of the huge amount of work carried on at the experiment farm may be gained from the fact that there are over 1,500 different grain seeds being experimented with, while the variety of fruits, flowers, and vegetables is almost as numerous.

SHIP PIERS AT AN ANGLE SOLVE SPACE PROBLEM

A growing problem of the San Francisco water front is the location of the government-pier head line, only 800 ft. from the sea wall. Adequate docking facilities for modern ocean traffic demand piers at least 1,000 ft. long. So far as new piers are concerned, the harbor commission has solved the puzzle by building them at an angle to the sea wall. One of these structures, projecting at 45°, attains on its outer side a length of 1,082 ft., with a width of 200 ft., while its inner and shorter side is 882 ft. long, without in the least encroaching upon the government boundary. Three other piers of varying angles exceed the theoretical 800-ft. limit by very useful margins. Navigation along the curved water front also is made easier by the fanlike arrangement of the pier ends, the wide space between them offering increased maneuvering possibilities.



The Map Gives a Fairly Accurate Idea of the Advantage Gained by Placing the Piers at the Right in Angular Relation with the Shore and the Government-Pier Head Line. The Airplane View at the Top Conveys the Same Information by Perspective

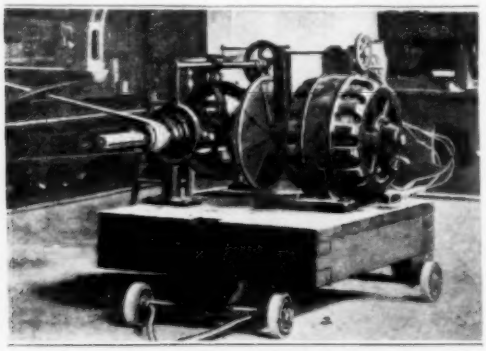
OAK TREES ARE MONUMENT TO SEVEN BROTHERS

Seven stately oak trees, growing so close together that their trunks seem to merge into a single butt, are pointed out to travelers in Louisiana as a memorial of seven brothers who planted the acorns from which they grew. The planting was done just before the Civil War, and each seed produced a strong and healthy tree. Festoons of moss on the branches of the trees add to the picturesque appearance of the group.

Seven Acorns, Planted by As Many Brothers Just before the Civil War, Produced This Beautiful Group of Oak Trees in Louisiana. Each Acorn Was the Seed of a Strong, Healthy Tree, a Monument to Its Planter

POWER PLANT ROLLS TO ANY PART OF MACHINE SHOP

For use in the laboratories of a technological school, a portable power plant has been developed that should recommend itself to many machine shops. Mounted on four iron wheels, the base or platform supports a 7-hp. motor with a friction transmission and a drive pulley. The apparatus rolls easily to any part of the laboratories, yet is so compact and heavy that it keeps its place regardless of the speed developed. The friction transmission gives easy control of the speed.



This Electric Power Plant may be Rolled to Any Part of the Shop on Its Iron Wheels. The Friction Transmission Varies the Speed as Desired

WILD FLOWERS BEAUTIFY CITY'S VACANT LOTS

Weed-covered vacant lots were converted into spots of beauty in a western city by the simple means of destroying the offending vegetation and sowing wild-flower seed in the unsightly areas. A man possessed of considerable civic pride started the work, which later was taken up on a larger scale by a men's club. Signs were erected on the beautified lots, requesting the public not to pick the flowers, and pointing out the economy and value of the scheme.

Vacant Lots in a Western City were Beautified by Sowing Them to Wild Flowers. Signs Request the Public Not to Pick the Posies

LONG-DISTANCE GUNS SHOWN TO LACK PRACTICAL VALUE

One of the things the United States did not develop during the war, and has no intention of developing now or in the future, is a long-distance gun. That the 75-mile German cannon that bombarded Paris could readily be surpassed, merely as a matter of engineering, has been demonstrated by the Ordnance Department with a set of interesting but wholly experimental figures, which never, in all probability, will be put to practical use. The theoretical gun is 225 ft. long, burns 1,440 lb. of powder, and throws a 500-lb. shell 121 miles. As the present length limit of forging is 70 ft., the hypothetical 225-ft. barrel would demand a radical increase in size of all steel-making equipment, from the furnaces to the lathes, already of giant dimensions. The barrel might, of course, be made in sections; but erosion troubles would undoubtedly manifest themselves, as the breech portion would be exposed to high temperatures for considerably longer periods. Such a gun would cost some $2,500,000, and its life would be short. The department's figures have their greatest value in proving that the long-distance gun is an impractical, extravagant, and useless engine.

EXPLAINS VOLCANIC VAPORS OF GREAT SMOKE VALLEY

Since the discovery of the Valley of Ten Thousand Smokes in Alaska, various theories have been advanced to explain the nature of the myriad emanations from the valley floor. A scientist attached to the exploration party disposes of the idea that steam from superheated drainage water is the cause, by pointing out the acid and metallic composition of the vapors. He considers the activity due to total decomposition of the water contained in the crust, and the subsequent reaction of the evolved oxygen and hydrogen upon the molten interior mass of the earth at extreme temperatures. The fissures through which the vapors escape were caused by the eruption, in 1912, of Mount Katmai.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

TREE-SPRAYING APPARATUS TOURS BIG TERRITORY

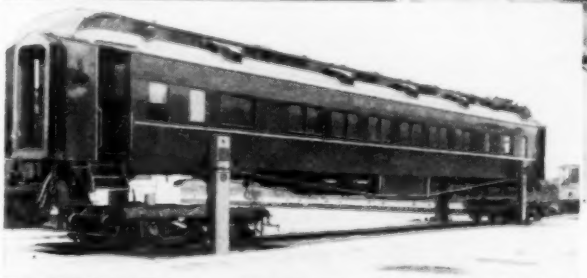
One of the developments of the fight against tree pests is a mobile power sprayer that is touring the middle West, working in certain localities only so long as its services are demanded, then moving to another field. The apparatus is mounted on the chassis of a stock model one-ton truck, and consists of a 385-gal. wooden tank for carrying spraying mixture; a pressure pump, driven by a gasoline engine; hose, spraying nozzles, and ladders, the latter for use when unusually tall trees are to be treated. A roof shelters the pump and engine, which are located behind the tank. Curtains, which are rolled down when the sprayer is on the road, to exclude dust, or in bad weather, further protect the mechanism. With 150 lb. of pressure, spraying mixtures can be thrown to a height of 56 ft. by an operator standing on the ground, while much greater heights can be reached by using ladders. A solution containing arsenate of lead is used in the sprayer in warm weather, and one made with lime and sulphur in cold weather.

Mobile Tree Sprayer That is Touring the Middle West: The Tank Holds 385 Gallons of Spraying Mixture. A Gasoline Engine Drives the Pressure Pump. All of the Apparatus is Mounted on a One-Ton Truck

ELEVATOR LIFTS PASSENGER COACHES FROM TRUCKS

For lifting heavy passenger coaches straight up off their trucks, a hoisting machine was recently installed at a large western car plant. The hoist consists of four huge screw jacks, two at each side of the track, the pair at one end being movable to accommodate cars of different length. The sills of the coach rest on brackets which project from the track side of vertical posts. The screws are operated in unison by electric motor, keeping the car body level at all elevations.

The Jacks Slide in Vertical Posts, the Brackets on Their Inner Sides Engaging the Sills of the Coach, Which is Thus Kept Level



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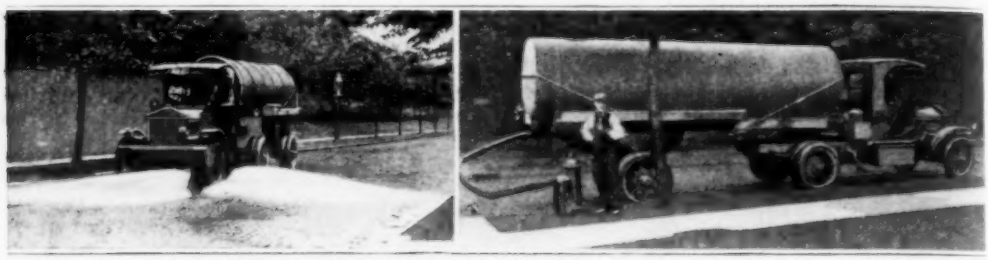
Heavy Passenger-Coach Body Lifted Clear of Its Trucks by the Four Stationary Jacks, Which Operate in Unison by Electric Drive



Motor Street Flusher and Sprinkler: The Mammoth Tank is Carried on a Detachable Trailer. On the Left, the Flushing Nozzles are Shown in Operation; at the Right, the Reservoir is Receiving a Supply of Water from a Hydrant

METAL-CHUTE FIRE ESCAPE USED AT INFANTS' HOME

Fire drill at an infants' home in Portland, Ore., is an exciting and pleasurable occasion for the youthful inmates.

Babies in an Infants' Home in Portland, Oregon, are Safeguarded by This Novel Fire Escape, a Zinc-Lined Chute Extending from a Second-Story Window to the Ground. The Picture Shows the Inmates and Their Attendants Enjoying a Fire Drill

An explanation of this lies in the unusual fire escape which is installed there. This is a zinc-lined chute, extending along the side of the building from a second-story window to the ground. Children old enough to sit up are allowed to slide, feet first, down the polished trough, and are caught at the bottom by an attendant. Smaller babies make the swift journey in the arms of nurses.

¶A course in jewelry designing has been added to the list of subjects taught in the public schools of Cincinnati. Instruction will be given by an Italian who studied the art in France.

TANK OF MOTOR SPRINKLER CARRIED ON TRAILER

Advantages claimed for a motor street flusher and sprinkler which has its tank mounted on a detachable trailer are that it has a greater water capacity than the ordinary machine of this type, and that the five-ton hauling truck can be used for other purposes if the trailer is removed. The tank holds 2,000 gal. of water. It can be filled from a street hydrant in six minutes, and emptied in four minutes. A pressure of 40 lb. to the square inch is created by the weight of the water when the tank is filled. Levers near the driver's seat control the flow of water through the nozzles, two of which are flat for flushing, and two round for sprinkling. All four of the nozzles are located in front of the radiator.

GERMANY PLANS ZEPPELIN SERVICE TO AMERICA

Although the treaty of peace with Germany calls for the surrender of all her dirigibles, a notice recently appeared in several New York newspapers advertising Zeppelin service between Duesseldorf-Berlin-Hamburg and New York-Boston-Chicago. Bookings for freight and passenger shipments were to be received after September 18, the first flight to be made a month later. It is believed, however, that the U. S. government will forbid the traffic, planned for years as a factor in Germany's post-war commercial offensive.

RESERVOIRS FOR NILE RIVER PROPOSED BY ENGINEERS

Engineers are studying the upper Nile River and its tributaries with the hope of evolving a practical plan for controlling the flow of water in that part of the great African stream. The problem is

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

considered to be one of the most difficult ever attempted, because of the length of the drainage basin and the peculiar conditions existing in the region where it is proposed to begin operations.

Because of the almost level channels of the White Nile and of the Lake Albert Nile, upstream from Khartum, these sluggish rivers are dammed by their swifter tributaries when the latter are in flood. Among these tributaries are the Blue Nile and the Sobat River. When the White Nile and the Lake Albert Nile are checked in this manner, their waters overflow into the flat lowlands alongside the streams, and remain there until they are lost by evaporation and absorption. The object of irrigation experts is to return this water to the river channels from which it came, when it is needed to maintain a steady flow downstream.

One of the projects being considered provides for the construction of extensive reservoirs along the Zaref River, a tributary of the Lake Albert Nile, and along the latter stream also, to receive the ponded water and return it to the river beds when downstream conditions become normal. By carrying out such a plan, a large area of land would be made available for agricultural purposes.

GARAGE BUILT OF ELEVATORS STORES AUTOS IN TIERS

The problem of caring for many autos in a limited ground space is solved by an Oregon designer, with a garage containing as many floors as an office building. The building is practically made up of banks of elevators, and each elevator likewise has many stories, or tiers of cells. The floor of each compartment slopes toward the rear, so that the car is safely retained in its stall, and any drippings of oil or gasoline are caught in a trough and piped away to protect the car below. By using hydraulic elevators, the tops of which are clear of obstructions, the entire garage floor space may consist of elevators, giving as much storage area as circumstances warrant. The method, while expensive, is declared to be really economical for locations of high ground value.

Garage of Many Stories, Made Up of Multiple-Tier Elevators in Which the Cars are Stored: Each Compartment Floor Slopes Back to Retain the Car, and Drainage Troughs Protect Lower Cars from Possible Dripping of Oil or Gasoline from Those Above. When the Hydraulic Elevators Are Down, Their Flat, Unobstructed Tops Make a Floor

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¶ Dough mixed with sea water produces bread which remains fresh longer than that made with fresh water, it has been discovered by a French scientist, who recommends the food as suitable for invalids and children. Water should be obtained some distance from land, and drawn from some depth.

PROFITABLE MINE LOCATED WITH HOMEMADE DRILL

That the resourcefulness of the trained mechanic, spurred by necessity or ambition, is equal to almost any demand is indicated by the experience of a Kansas farmer, who had formerly been employed in a Pennsylvania prospecting-drill factory. His farm was located in a mining district, and lead and zinc ore had been found within 50 ft. of its boundary fences. The farmer, unable either to interest his neighbors in a coöperative venture, or to employ a driller to sink three or four 200-ft. holes at $1.50 a foot, set out to rig up his own drill. An old, but serviceable boiler, and the parts of a wrecked tractor supplied all the mechanical needs; secondhand mine timbers built a good tower, and a discarded cable made a rope for the drill points, which latter were the only items purchased new. This improvised equipment, representing an investment of $260 for materials and hired labor, struck "pay dirt" at the first boring. Its task thus completed, it was immediately rented out to the converted neighbors for enough to pay the cost of sinking a shaft, plus $2,000 profit. After three months the shaft had yielded some $2,500 worth of ore—and the homemade drill is still working.

Prospect Drill Made from Parts of a Junked Tractor and Secondhand Boiler, Timbers, and Cable, Which Struck Ore in the First Hole It Bored on a Kansas Farm

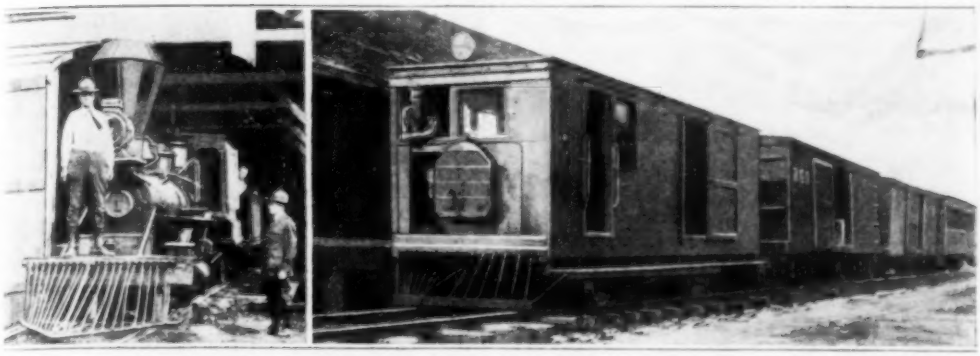
FERTILIZING POWDER SERVES IN SPRAYING SOLUTION

Used in dry form, a dual-purpose powder recently placed on the market is valuable as a fertilizer, according to its manufacturers, who declare that it produces a satisfactory solution for spraying trees and vegetables when dissolved in cold water. The compound is said to be nonpoisonous, except to destructive insects, and to be harmless to vegetation when used either dry or in solution. It is also odorless.

GASOLINE MOTORS SUPPLANT WOOD-BURNING ENGINES

Powerful six-cylinder automobile motors, geared to the wheels of diminutive box cars, haul trains over a 22½-mile narrow-gauge railroad which connects Brownsville, Tex., with Point Isabel, the latter a port on the Gulf of Mexico. Gasoline has entirely superseded steam on this line, the ancient wood-burning loco-

The Mine as It Appeared Three Months After the Homemade Drill had Shown the Way to Fortune: The Ore in Sight and Ready for Sale was Estimated to be Worth $2,500, and All Expenses of Sinking the Shaft were Paid by Renting Out the Original Drill—with a Profit Besides



The Old and the New: One of the Antiquated Steam Locomotives Formerly Used on a Short Texas Railroad is Shown in the Smaller Picture, While Its Successor, a Swift, Gasoline-Propelled Car, Appears in the Larger

motives formerly used having been retired several months ago, when experiments showed the more modern power plants to be superior. One great advantage of the motors is that the fuel used by them is more easily obtained in the border country than wood or coal. Quite frequently the gasoline-propelled trains attain a speed of 30 miles an hour, and at all times they run according to schedule, if the track is in proper condition. The right of way runs through low territory, which is dotted with small lakes and salt marshes, and the tracks are sometimes submerged by flood water from the Rio Grande, which flows not far away, or from the gulf on occasions when a violent storm is raging there.

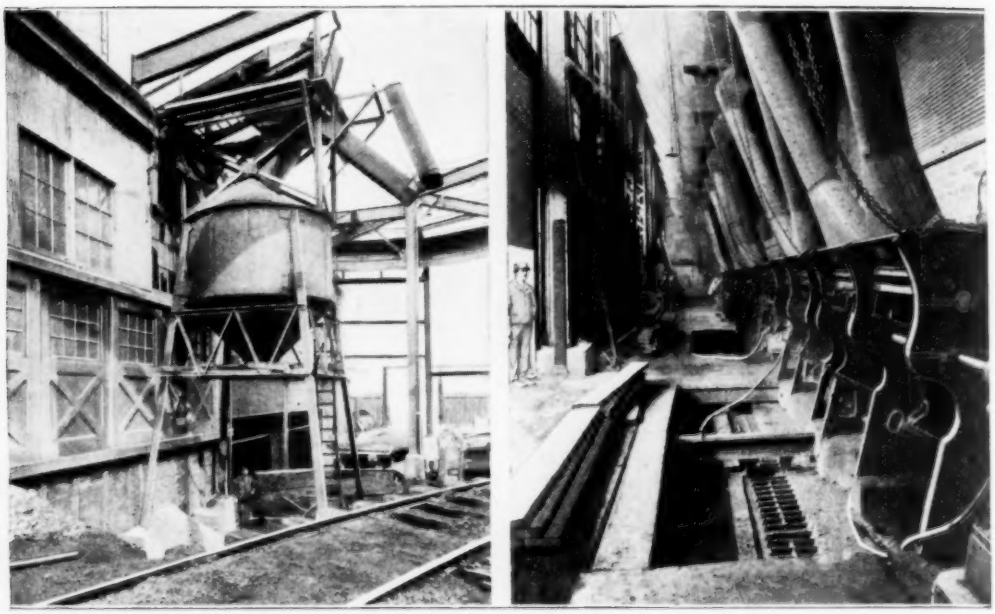
RAILROAD ACCIDENTS FEWER DURING CAMPAIGN WEEK

Interesting statistics are given in a report on the "No Accident Week" campaign conducted during seven days of June by the railroads of the northwestern and central-western regions of the United States. In the former region, 50 out of the 63 railroads in the territory had no accidents during the week. During the corresponding week of 1918 there were 481 accidents on these roads, while those of the campaign week numbered only 119. These roads operate over 52,868 miles of track. Sixty-seven railroads, having 55,000 miles of track in the central-western region, reported 98 accidents for the campaign week, compared with 456 for the same week of the previous year. Out of the total number of roads in this region, 47 had clear records for the seven days. Over 600,000 railroad employes work in the two regions.

AIRPLANE MAKES LANDING IN BRANCHES OF TREE

The modern airplane seems to outdo the bird in looping, tailspinning, and similar stunts; yet it has previously yielded the palm to its small rival in the routine matter of alighting in a tree. Now the airplane has accomplished even that—after a fashion. The mishap occurred while an army airman was flying in the interests of a savings campaign. His engine suddenly went dead, dropping his plane into the branches, where it wedged and stuck.

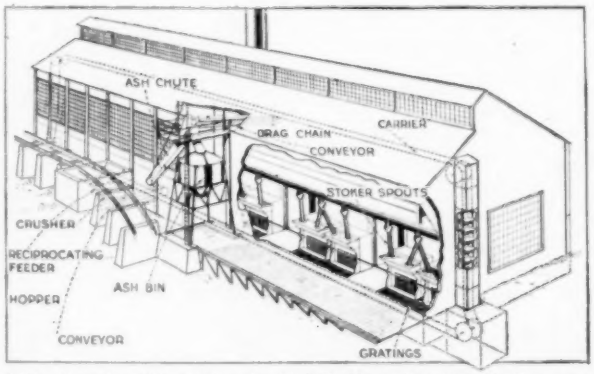
The Fortunate Airman Stands behind the Big Limb, Snapped Off by His Airplane in Making Its Unexpected Landing in the Treetop



Mechanism for Handling Coal and Ashes: The Track-Side Bin for Ashes can be Seen in the Picture on the Left. At the Right are Shown the Floor Gratings through Which Material Removed from the Furnaces Drops into the Conveyor

ENGLISH PASSENGER DIRIGIBLE WILL CRUISE TO BRAZIL

Popular interest in the projected voyage of the dirigible "R-80" from Barrow in Furness, England, to Rio de Janeiro, Brazil, and return, has lately been aroused by the sale of three round-trip tickets at $5,000 apiece. An English gentleman made the purchase, intending to take with him his wife and a friend. With the 17 other passengers they will travel in the utmost comfort, having the liberty of a large saloon, a "roof garden," a shelter deck, and private sleeping cabins, all situated in the top of the hull. The power gondolas below will drive the ship at a cruising speed of 46 miles an hour. The dirigible "R-80" is 535 ft. long.



This Drawing Illustrates in Detail How the Double-Purpose Conveyor is Installed. The Furnaces, Equipped with Stoker Spouts, can be Seen through the Opening in the Wall of the Building. Other Parts of the Device are Shown in Dotted Lines

SINGLE MECHANISM HANDLES BOTH COAL AND ASHES

Both coal and ashes are handled by a single mechanism in a large paper mill in the East. A conveyor of the carrier type, running above a suspended coal bin and underneath grates in front of the boilers, is the most important moving part. Ashes removed from the furnaces drop through the gratings into the conveyor and are carried to a point above, where they are dumped, either into a special compartment in the coal bin, into a drag-chain conveyor that carries them to a bin outside of the building, or to a coal-loading chute. The same carrier-type conveyor handles coal, which is fed into it at the lower level after being crushed to a 4-in. size. Carried to

the higher level, the coal is dumped into the bin, from which it is carried by spouts to the stokers.

LAUNCHING DEVICE TESTED IN ENGLISH SHIPYARD

Metal devices to replace the wooden blocks which are used ordinarily under the keels of vessels during construction have been tested by an English shipbuilding firm, and are said to make launching a shorter and more easily accomplished operation. These cap pieces are in two parts, and are held together by a key. When the key is removed, the top portion of the contrivance can be taken off, allowing the hull to come in contact with the launching ways. With wooden cap pieces, it is necessary to cut away the top portion of the blocks, which is a long and difficult task.

INDIAN VISITS U. S. WEARING HUGE DIAMOND ON NOSE

A few hours after a wealthy cotton manufacturer from Bombay had registered in a San Francisco hotel, with wife and retinue, curiosity reached fever heat in both kitchen and dining room. In the kitchen the cooks watched the Indian chef as, with two assistants, he prepared strange vegetable dishes. And in the dining room scarcely a woman could keep her eyes from the visitor's wife. For on her forehead she displayed the tattooed mark of her caste; and in a hole through her nose was fastened a $6,000 diamond.

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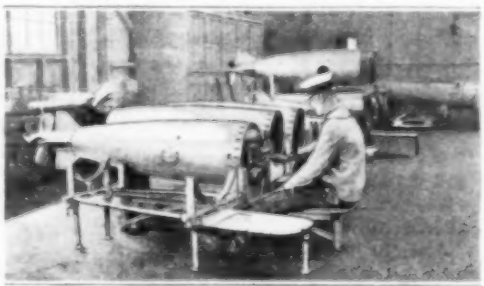
AUTO TRUCK STEERED BY BOTH FRONT AND REAR WHEELS

The auto truck that drives from all four wheels now yields as a novelty to the truck that both drives and steers from all four. The driver is provided with two steering wheels with which he can turn front and rear wheels together or separately. For straightaway driving the rear wheels may be locked in the conventional position. Extreme maneuverability in crowded quarters is of course the merit of the new truck. It can approach a loading platform from the side, crab-fashion; the inventor even claims that it can be turned through a figure "8" within the smallest circle made by other trucks.

This Auto Truck Drives and Steers from All Four Wheels. It can Thus Approach a Platform Sidewise Like a Crab, and be Put through a Figure "8" within a Small Circle

SPECIAL WORKBENCH SPEEDS UP TORPEDO REPAIRS

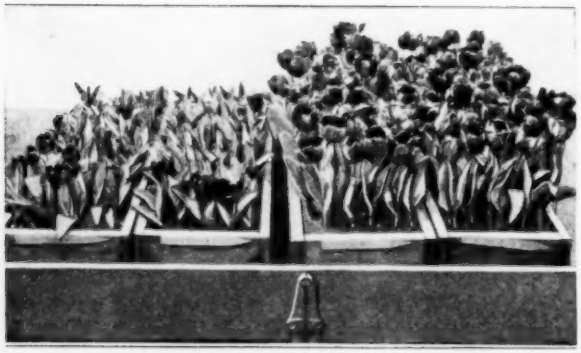
Among the time and labor-saving methods inaugurated by our navy is one which might well be imitated, in spirit, by every shop in which similar work is done. When it becomes necessary to repair the vitals of a torpedo, it is placed on a low rack, or bench, of special design. The workman sits in comfort on an attached seat, with the disabled motor directly before him. Spared the necessity of crawling around and under his job, the operator finishes his repairs quickly.



With the Disabled Torpedo Held on One of These Convenient Racks, the Navy Workman Makes His Repairs in Comfort and with Consequent Efficiency

NATIVE BULBS REPLACE IMPORTED PRODUCT IN AMERICAN GARDENS

By R. P. CRAWFORD



The Imported Plants in the Two Trays at the Left Are of Little Commercial Value, and Seem Stunted When Compared with the Tall, Healthy American Product at the Right

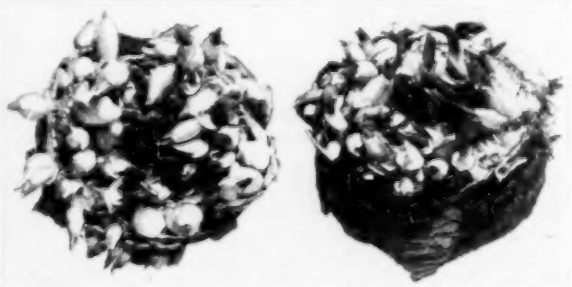
IN a few years America may no longer be dependent on foreign sources for its supply of flowering bulbs, such as hyacinths, narcissuses, and tulips. It is little known that Holland and a few other of the foreign countries have been shipping into the United States a million dollars or so in Dutch bulbs every year. Recently, however, the Department of Agriculture has been carrying on investigations looking to the establishment of this bulb-growing industry on American soil, and now the dreams of the hyacinth and tulip enthusiasts seem to be approaching fulfillment.

This Machine "Scoops" the Mother Bulbs by Cutting the Base, to Expose the Scales

Since 1909, the department has maintained a six-acre bulb garden at Bellingham, Wash., this location being chosen because believed to be somewhat similar in soil and climatic conditions to the Netherlands and the island of Guernsey. Production of home-grown bulbs from the imported stock has been a matter of some years, and it is only recently that the work has been brought sufficiently under way to permit public distribution of large quantities of home-grown bulbs. In the fall of 1917, however, an entire carload of bulbs was shipped east from the Bellingham gardens to be used in the congressional seed distribution, being the first carload of home-grown bulbs ever sent across the country. It was followed in 1918 by another shipment.

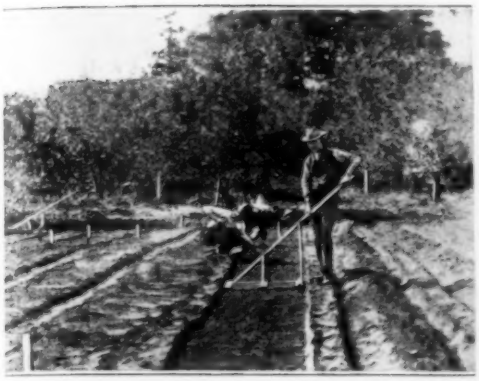
An interesting method of propagating hyacinths is practiced at Bellingham. It consists in "scooping" or "scoring" the bulbs, so that instead of flowering they produce a great crop of baby bulbs. "Scooping" consists in cutting the base of the bulb so as to expose the scales near their union with the base. "Scoring" is slightly different, involving two to four cuts across the base of the bulb to destroy the growing point.

In both cases the bulbs are set out in the sun for a short time to dry the surfaces, after which they are placed in a propagating house where an even summer temperature is maintained. In about four months the mother bulbs have produced a fine crop of baby bulbs and are planted with the little bulbs attached. At harvest time, in June or July, the mother bulbs have practically disappeared and in their place are found scores of these tiny bulbs.



After Four Months in the Propagating House, These Mother Bulbs have Responded to the "Scooping" Process by Growing a Number of Tiny Bulbs

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.



Government Gardeners at Bellingham are Seen Cultivating the Domestic Hyacinth Bulbs with Which So Much Success has been Attained

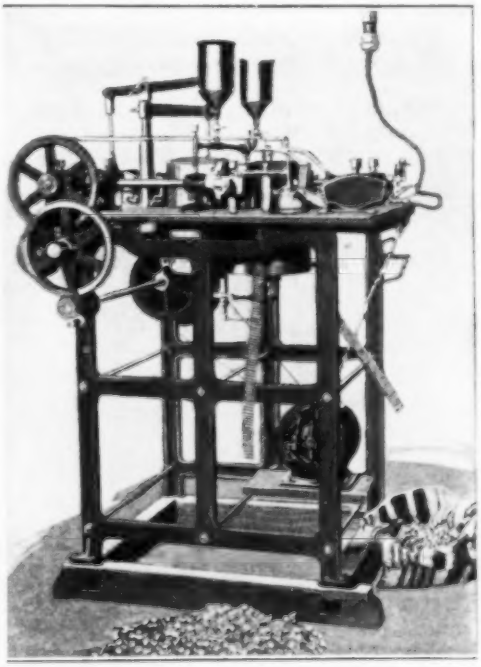
Tulip Bulbs are Here being Planted in the Furrow Beds. Due to These Government Experiments the Traditional Superiority of the Foreign Bulbs is No More

These are sorted out for further planting. At the Bellingham station a machine has been invented which is used to "scoop" the bulbs. From a total of 2,441 mother hyacinth bulbs planted there it was possible to develop by "scooping" over 55,000 new bulbs, while from 2,101 bulbs which were "scored," better than 19,000 new bulbs were produced. With these methods it takes from three to seven years to develop bulbs ready for market. With narcissuses, propagated by means of offshoots, commercial bulbs are ready for public distribution in three to five years.

Other investigations at the Bellingham station have demonstrated that narcissuses of high quality can be developed in the United States. In the case of tulips it is even asserted that the home-grown bulbs are superior to the imported. Plants grown at Bellingham were freer from disease and flowered nearly a week ahead of the imported bulbs, displaying healthier blossoms and larger stems.

MEXICAN INVENTS MACHINE TO CAST LEAD SEALS

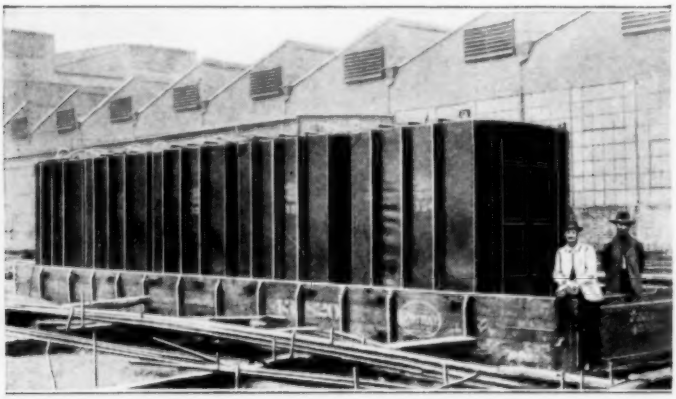
From bandit-infested Mexico comes an invention which is declared to be a pioneer in its field, that of casting lead seals for freight cars, express packages, and mail pouches. The machine, which is electrically operated, was devised by a resident of Monterey, and has been patented in the United States. While a somewhat complicated mechanism is used, the caster consists essentially of a pot in which lead is melted, a mold form between the ends of two slightly separated horizontal plungers, and an unusual means for transferring molten metal to the mold. The latter operation is accomplished by thrusting a displacing member into the melting pot at the moment the mold is ready to receive material. This raises the level of the molten metal and causes it to flow through a notch in the rim of the pot to the gate of the mold. As soon as the metal hardens in the mold, it is moved by the plungers to the point where it is discharged. The capacity of the machine is 1,000 seals an hour.



Invented by a Mexican, This Machine Casts 1,000 Lead Seals in an Hour. Heretofore Such Work has been Done by Hand

STEEL FREIGHT CONTAINERS FOR BOATS AND CARS

Efficient utilization of freight space on cars and vessels is the chief purpose of the boxlike steel containers which are being tested on a river-boat line of the South. These are essentially large metal packing cases, each one of which is intended to serve instead of numerous boxes and barrels, which cannot be loaded without wasting room. Loading costs are expected to be reduced by their use, and the possibility of loss by leakage eliminated. Five of the containers can be placed on an ordinary flat car, and securely locked to protect the contents from damage by the elements or thieves. Each container is capable of holding 15 tons of merchandise. It is proposed to erect cranes at factories, freight depots, and docks to lift the steel boxes on and off carriers. Means are provided on the boxes for attaching hoists.



Five of the New Steel Freight Containers, Loaded on a Flat Car: The Carrying Capacity of a Train or Boat is Increased by the Use of These Metal Boxes, Which can be Securely Locked to Protect Their Contents

SWIMMING-POOL SEDIMENT REMOVED BY CLEANER

Swimming pools need not be drained for cleaning with a device recently placed on the market. This operates in much the same manner as a vacuum cleaner. A centrifugal or rotary pump, connected by a flexible suction hose with a cleaning tool, sucks sediment-laden water from the bottom of the tank, while a brush on the cleaning tool loosens dirt that adheres. The cleaning tool is attached to the end of a long metal pipe, which serves as a handle for the operator of the contrivance, who can reach all parts of the pool while standing on the floor around it. Because of its simplicity, the device seldom requires repairs.

Cleaning a Swimming Pool with a New Device That Operates under Water in Much the Same Manner as a Vacuum Cleaner

AIRMAN FLIES ACROSS SOUTH AMERICA AND BACK

The part the airplane is to play in uniting the scattered cities of South America was recently demonstrated by an Italian airman, member of the Italian aviation mission which is visiting Argentina. From Buenos Aires, on the east coast, he flew across broad plains and over the jagged Andes to Valparaiso on the west coast, and then to Santiago, the capital of Chile. A few days later he flew back to Buenos Aires without a stop, making the 700-odd miles in just seven hours and ten minutes. The other members of his mission rose in their planes to welcome him on his return to the eastern capital.

¶American newspapers carried by the "R-34" reached London, England, 11 days before others of the same date, sent by the ordinary steamship mail.

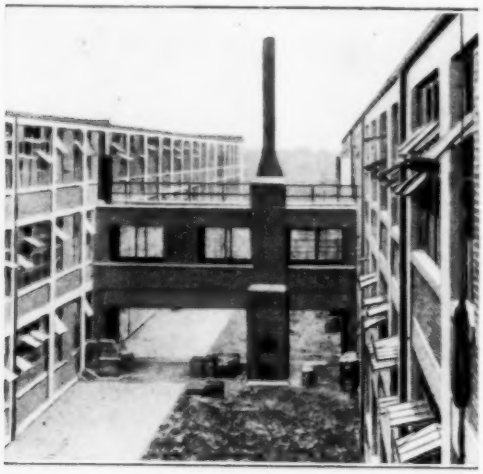
HEAVY RAINS BRING FLOODS TO NEW JERSEY CITIES

The Streets of Morristown, New Jersey, Became Raging Torrents When a Dam Broke, Releasing the Waters of a Lake Two Miles from the Town. One of the Improvised Ferries Run by the Police Carried Passengers across the Flooded Thoroughfares in an Ash Can

Swollen by the Heavy Rains Which Fell during the Latter Part of July, Streams in Northern New Jersey Overflowed Their Banks and Inundated Many Square Miles of Territory. A Scene at the Flooded Naval Rifle Range, at Caldwell, is Shown Above. Soldiers, Sailors, and Marines, to the Number of 1,500, were Driven from Their Barracks and Forced to Seek Refuge in Buildings on Higher Ground

GARBAGE INCINERATOR USED BY NAVY DEPARTMENT

A garbage incinerator, designed for apartment buildings or houses, is being



Papers of a Confidential Nature are Destroyed by Navy Department Employes in the Incinerator to be Seen in the Center of Picture

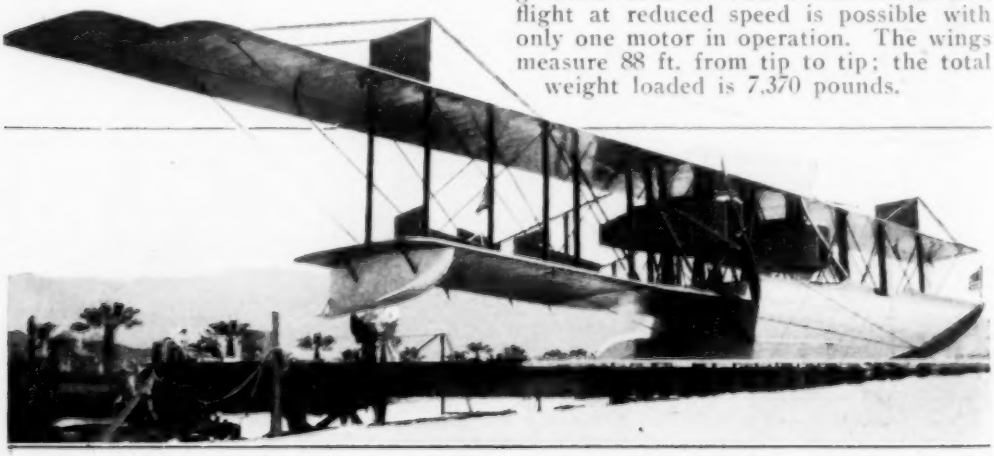
used by the Navy Department at Washington, D. C., for destroying old code books, copies of secret orders, and other confidential matter. The burning chamber of the incinerator is located near the bottom of a brick chimney, which is somewhat enlarged at that point, to accommodate gratings. Hopper doors are provided on one or more floors for dumping refuse into the chimney, through which it falls to the burning chamber. These are constructed so that when the hopper is pulled out for receiving trash, a metal apron closes the opening in the chimney. Doors for draft regulation, firing purposes, and ash removal are placed in the wall of the burning chamber.

METEOROLOGIST SUGGESTS ODD USE FOR SURPLUS MUNITIONS

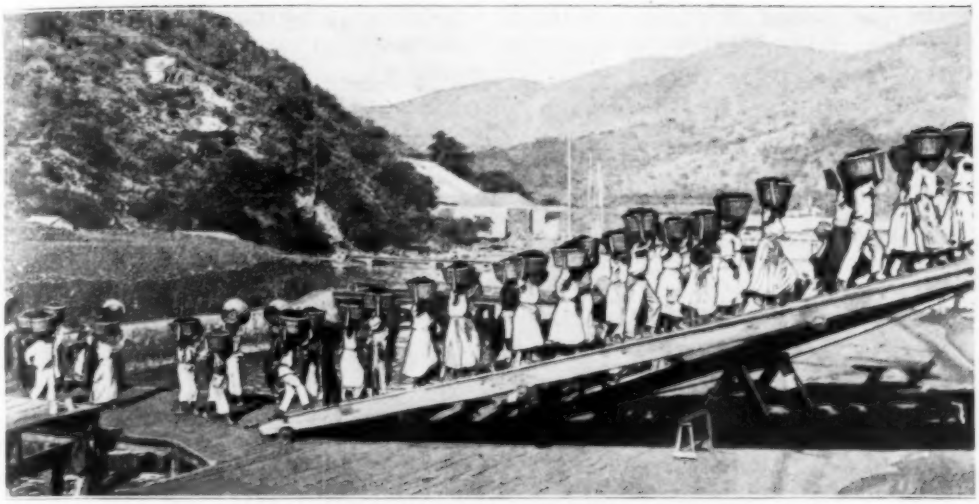
In considering the monster accumulations of surplus war materials now stored in all corners of the earth, it must be remembered that depreciation is rapid, even in time of peace. Big-gun ammunition, in particular, deteriorates quickly, becoming dangerous to handle and uncertain in operation. So a Swiss meteorologist suggests that the big shells be used in a gigantic, unprecedented experiment, which should clarify many long-debated questions, among them the relation between detonation and rainfall. He would have the shells collected in great dumps of definite dimensions, at definite places. By exploding the shells at a stated time, the accompanying phenomena could be charted by the weather men with some approach to accuracy.

BROTHERS BUILD BIG SEAPLANE FOR PASSENGER TRADE

Beginning their work in November, 1916, two brothers have now completed the construction of what they believe to be the world's largest seaplane designed solely for passenger carrying. The hull will seat 10 as its regular complement, but has flown easily with 18 passengers. The two motors give a speed of 80 miles an hour when carrying 10 persons and gasoline for a 450-mile cruise. Horizontal flight at reduced speed is possible with only one motor in operation. The wings measure 88 ft. from tip to tip; the total weight loaded is 7,370 pounds.



As a Result of Three Years' Experiment and Toil, Two Brothers have Built This Large Passenger-Carrying Seaplane, Declared by a Naval Expert to Be Easier to Handle Than the Smallest of the Naval Scout Planes



LOAD COAL ON SHIPS BY HAND AT AMERICA'S NEWEST PORT

WHEN an American battleship is coaling up at the harbor of St. Thomas, the United States' newest island possession in the West Indies, an endless procession of negro women, each with a heavy basket poised on her head, passes up the gangplank, disappears, and presently returns with the basket empty. These sturdy workers take the place of coaling machines quite effectively; for they carry as much as 125 lb. of coal apiece, and the human chain of a hundred links or more will load 100 tons an hour. They charge one cent a basket, from the coal yard to the ship's bunkers, thereby making perhaps 50 cents a day. Charlotte Amalie, capital of St. Thomas, is a most beautiful city, a fine winter resort as well as an ideal naval base. The island was purchased from Denmark because it is one key to the Panama Canal.

NEW PROCESS KILLS GERMS IN LIQUID FOOD WITH FIFTY-TON PRESSURE

To crush the life out of disease germs, of the kinds that inhabit milk and other liquid foods, takes a pressure of 20,000 to 100,000 lb. to the square inch. The chemical expert of a West Virginia college, in discovering this fact, found also how to apply such pressures to liquids.

For this purpose, a hydraulic press is used, with a heavy steel test cylinder, 7 in. long, 6 in. in outside diameter, and of 1¼-in. bore. A steel plug is fitted to each end of the bore, and between them a lead tube, for packing, filled with water and closed with a lead cap. In the water is placed a collapsible tin tube full of the liquid to be sterilized. While the pressure is being applied there is no leakage, although the lead packing is generally ruptured by the return to normal pressure. Instead of the collapsible tin tube, a glass vial, sealed with a wax plug, or with a collapsible tin top, is used when visual study of gas generation is desired, the movable closure acting as a piston to equalize the pressure inside and out.

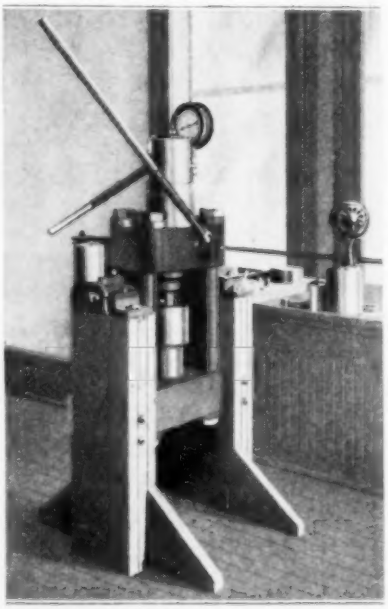


PHOTO BY GILLIAMS SERVICE

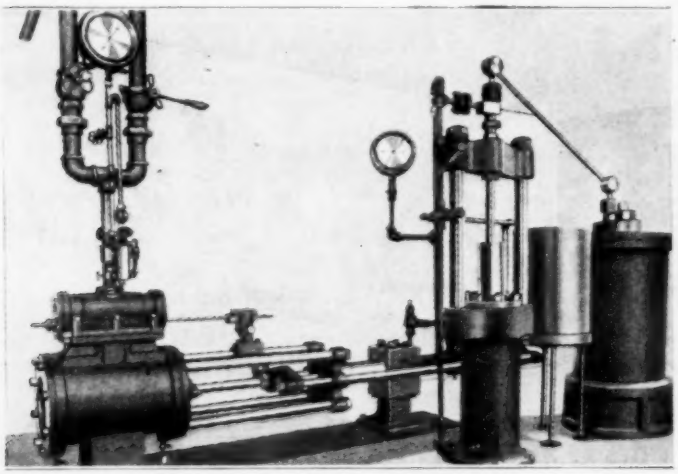
The Hydraulic Press Used for Obtaining the Enormous Pressures of the Test, with the Heavy Steel Cylinder in Place

With this apparatus, it is found that the maleficent bacteria in milk are wholly destroyed by pressures considerably lower than 100,000 lb., while the beneficent enzymes are unaffected, as the pressure is applied at normal temperatures. For much of this work

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

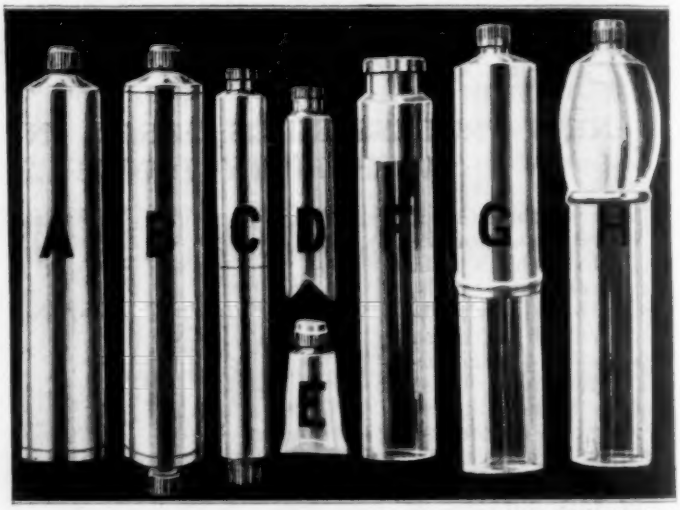
30,000 lb., applied 20 minutes, is found adequate. While experiments with vegetable products are not very satisfactory, fruit juices respond splendidly to the process. In grape and apple juices, under 90,000 to 100,000 lb., all alcoholic fermentation ceases, and they remain unchanged after long storage. By this method fruits and some vegetables might be preserved without the use of sugar or other substances, leaving their chemical composition practically unaltered.

The commercial application of the pressure method of sterilization will solve the vital problem of making liquid foods pure and "keepable." That means relief from those sinister records of infant mortality, so much of the responsibility for which rests upon the bacteria of disease and decay in milk. The germs of diphtheria and typhoid, known to thrive in milk, are among the first to succumb to the application of pressure, and the process of rendering them innocuous would therefore be positive and reliable.



Pressure Equipment Used for Fruits and Vegetables: Compression Chamber Is in the Iron Water Bath at Right, with Copper Tank Next to It. Pressures of Horizontal Pump at Left are Multiplied by the Vertical Pump

¶ The establishment of a new botanical garden in Versailles is proposed for France to supplement the historic old Jardin des Plantes in the heart of Paris, with its nurseries, greenhouses, museums, and lecture rooms.



PHOTOS BY GILLIAMS SERVICE

A, B, C, D, and E Are Types of Collapsible Tin Tubes Used as Containers of the Test Material; F Is a Glass Phial with Wax Stopper; G and H Are Glass Tubes with Tin Tops Sealed On

BRAIN POWER

By LYDIA M. D. O'NEIL

Back of the oil are the well drills that pound
Steadily, steadily, into the ground.
Back of the lighting, the power plant's force—
Wondrous its working and secret its source.
Back of the fabric, the loom that must weave it;
Back of the loom are the hands that achieve it;
But back of the dream and the perfected plan,
The invention of Nature—the brain of a man!

Back of the message, the wireless spark,
Outracing the sunbeams and cleaving the dark;
Back of the airplanes, the motors that dare
Contend with and conquer the forces of air;
Back of the bullet, the rifle that whirls it;
Back of the missile, the cannon that hurls it;
Back of the fortress, the engineer's plan,
But back of the blueprint—the brain of a man!

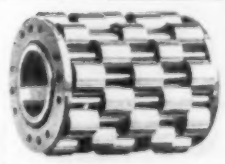
Yea, we may soar as the winged eagles soar,
And the uttermost caverns of ocean explore;
Laugh at the barriers of desert and sea,
And be free as the winds of the world are free.
Ours is the earth; we shall wield it and mold it;
The scroll of the ages shall seize and unfold it;
This only shall baffle direction and plan:
None can fashion or fathom the brain of a man!

ARTIFICIAL LAKE PROPOSED FOR AFRICAN DESERT

Climatic conditions in South Africa would be improved by the creation of an artificial lake in Kalahari Desert, according to a scientist who has made a study of that section of the continent. His plan for placing water in the arid region is not a new one, however, as it originated with David Livingstone, the famous explorer, who saw the possibilities of such a scheme many years ago. To form the desert lake the scientist would construct a dam near the mouth of the Shobe River, which flows into the Zambezi River near Victoria Falls, and another in the Kamene River, near the border of Angola. Low dams would hold back the waters of these streams and cause them to flow into the desert basin. If it became desirable to increase the size of the lake, this could be accomplished by building a dam across the Zambezi River.

ROLLER ARRANGEMENT GIVES STRENGTH TO ODD BEARING

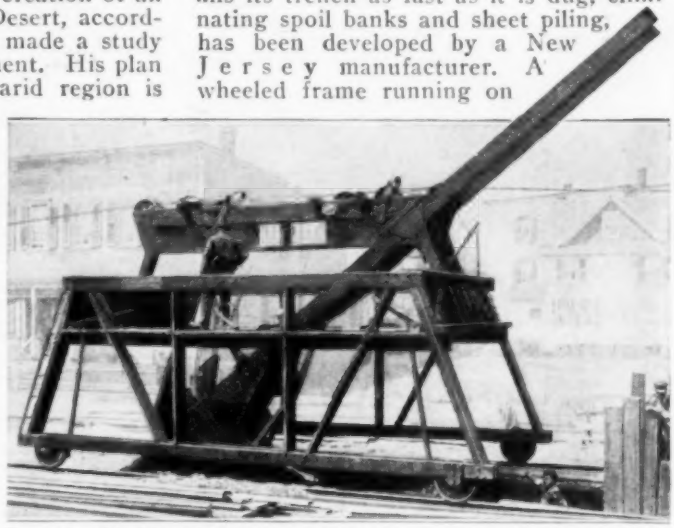
Manufacturers of roller bearings will watch with interest the commercial success or failure of an odd bearing made by an eastern plant. In place of the conventional rollers, this bearing employs a greater number of discontinuous rollers which are staggered to mesh with each other. Each set is so mounted on an alinement shaft that the roller at one end rotates independently of the other. The novel arrangement is said to insure smoother flow of lubricant than with the old type, in addition to an ability to bear a greater load.



The rate of pay established during the war for the enlisted men of the U. S. Navy is now permanent, so that the lowest is about $32.60 a month.

MODERN TRENCHING MACHINE BACK-FILLS AS IT DIGS

A trench-digging machine that backfills its trench as fast as it is dug, eliminating spoil banks and sheet piling, has been developed by a New Jersey manufacturer. A wheeled frame running on street rails carries a dipper bucket, whose beam is operated by an engine on a car stationed ahead of the trench. The operating cables, temporarily anchored at the opposite end, serve also to move the machine along, the excavated material being at once carried back and dumped. With two operators, on a winter job, the machine dug 100 ft. a day in clay, 80 ft. in gravel and sand, and 30 to 40 ft. in hardpan, the trench being 4 ft. wide and 11 ft. deep.



Trenching Machine That Carries the Excavated Material Back and Refills Its Own Trench, the Cables That Operate the Dipper Bucket Also Moving the Machine along the Track

DANISH PROCESS MAKES WOOD HARDER AND MORE DURABLE

A patented process for artificial ageing and hardening of wood forms the basis of a new industry in Denmark, whose product, whatever the raw material, is designated by the general term "teakin wood." Ash so treated is declared to take the place of genuine teak. Fir takes on a solid color and character that renders it desirable for furniture, office fittings, and veneers. Birch becomes mahoganylike, and even elm loses its unsatisfactory peculiarities. The normal ageing effects of years are said to be accomplished in 24 hours, and subsequent evaporation of retained moisture leaves the wood remarkably hard and durable.

SANDWICH COUNTER ON CAR SELLS TO PEDESTRIANS

Commercial enterprises of all sizes have found the motor vehicle valuable.

Hungry Pedestrians in an Eastern City can Buy Sandwiches, Doughnuts, and Cakes from the Young Woman Owner of This Shelf-Equipped Automobile

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One of the smaller businesses to benefit by using the automobile is that of a young woman who sells sandwiches, doughnuts, and cakes in a large eastern city. The wares are displayed on an awning-sheltered shelf on the side of a common type of light touring car, which is driven wherever the chances for trade are best. When the machine is drawn up at the curb, the food on the shelf attracts the patronage of many pedestrians.

AIRPLANE RIDES STRENGTHEN TUBERCULAR LUNGS

Believing that the thin, pure air of the mountain tops possesses power to strengthen tubercular lungs, a number of French physicians have found a way to give their patients this mountain cure without the necessity of a long, tiresome railroad journey. Carefully wrapped and secured in airplanes driven by experienced airmen, the afflicted ones are carried each pleasant day to an altitude of about 11,000 ft., where the air is believed to be most curative. It is pointed out in this connection that airmen seem to have been but little affected by the "white plague" during the war, when compared with their comrades in the infantry and artillery, among whom the mortality from this cause was high.

¶ The airplane mail service is now on the same basis as the railroad train service, first-class matter being carried at the regular rate of two cents an ounce.

WALL AROUND CANTON RAZED BY MODERN CHINESE

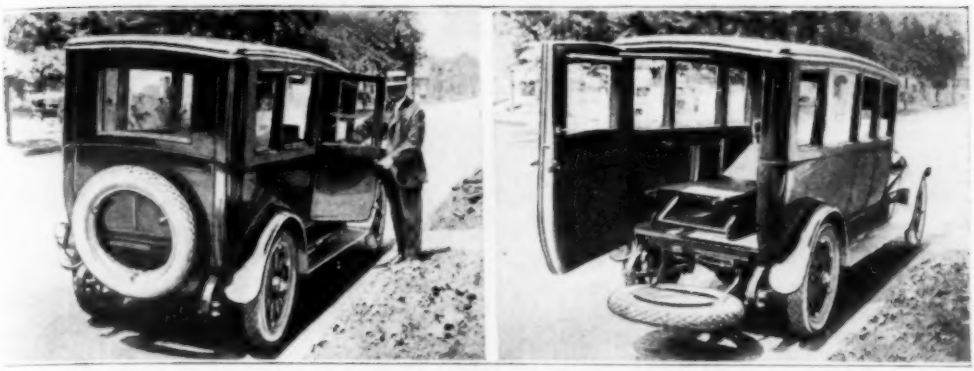
Built centuries ago to protect the city from organized armies and marauding bands, the wall around Canton, one of the large cities of China, is being razed to make room for modern utilities. On its site will be laid tracks for electric cars, while parallel with the tracks will be built an improved road for motor vehicles. The value of the highway lies in the future, for at the present time there is but one automobile in Canton, according to recent visitors in the oriental metropolis. Moreover, unless that portion of the city which is inclosed by the wall is rebuilt on a different plan, motor cars will be restricted to the outskirts of Canton, as the streets of the inner city are too narrow to permit the passage of such vehicles.

MUSHROOMS SUPPLANT BEER IN EASTERN BREWERY

Mushrooms have supplanted beer in a large brewery located in an eastern city since the advent of prohibition, and their sale is proving almost as profitable as was that of the now forbidden beverage. The delicacies are grown in the extensive underground rooms of the plant, where conditions are exactly suitable to their cultivation. A force of men is kept busy harvesting the crop and packing it for market.

Harvesting Mushrooms Grown in the Cellar of an Eastern Brewery: This Crop Returns a Large Profit on a Small Investment

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.



The Graceful Limousine at the Left Is Really an Ambulance, as Seen at the Right. The Tire Rack Swings Down to Become a Broad Step; the Entire Rear End Opens to Disclose a Roomy Interior, Luxuriously Upholstered, and Provided with Folding Chairs and a Comfortable Stretcher-Cot. The Similarity to a Conventional Police-Patrol Wagon has been Studiously Avoided

CONVERTIBLE LIMOUSINE BECOMES AMBULANCE

By means of a few clever departures from conventional design, a body-building concern has produced an automobile ambulance that differs little in appearance from the ordinary limousine. The customary similarity to a police-patrol wagon has been carefully avoided. To receive the patient, the whole rear end of the body swings open, revealing a roomy, upholstered interior. Meanwhile, the rear tire rack has been swung down to become a broad step.

SKELETON OF GIANT WHALE MOUNTED ON TRUCK

Assembled on a truck, the bones of the large whale which was washed ashore at Pablo Beach, Fla., as described in the August issue of Popular Mechanics, will be taken through the country and exhibited at different points. While preparing the skeleton for the tour, workmen found that two sections of the bony structure were tubercular. It is believed that the disease disabled the giant mammal, causing it to drift into southern waters. Six weeks were required to mount the skeleton.

CEMENT WATER-PIPE UNIONS TRIED IN WESTERN CITY

Cement as a substitute for lead in connecting the joints of cast-iron water pipes is employed in Portland, Ore., and is declared to have given satisfactory results, besides being cheaper than the metal. An extremely dry mixture is used, this being forced in at the unions over a small quantity of yarn or oakum, which is driven in before the cement is applied. It is necessary to keep the joints wet for 36 to 48 hours after the work is done. Nine miles of mains have been laid in this manner during the last two years, requiring 19,256 lb. of cement. The same installation would have required 68,390 lb. of lead, costing 16 times as much.

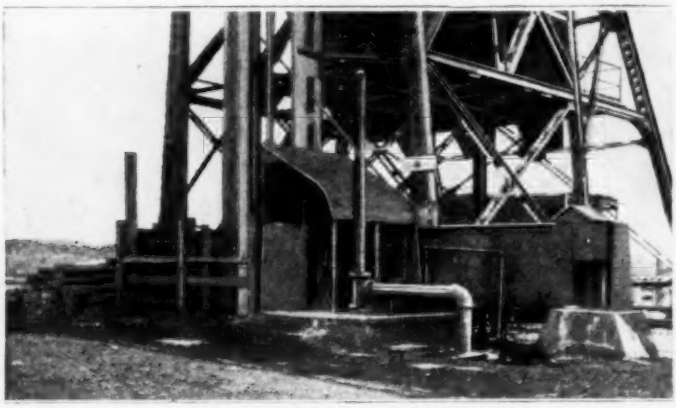
STEAMING COFFEE-CUP SIGN ADVERTISES RESTAURANT

Patrons are attracted to a lunch room in a western city by a novel advertising device invented by the manager of the eating place. Fastened to the upper edge of the electric sign, which extends over the sidewalk in front of the restaurant, are a huge cup and saucer, fashioned of metal to resemble chinaware. From the cup steam rises continually, giving the impression that the vessel is filled with hot coffee. The designer of the contrivance has obtained a patent on the system for supplying steam to the cup. In operation it is connected with the heating plant of a building.

A Steaming Cup on an Electric Sign in Front of a Lunch Room Suggests Coffee, and Attracts Patrons to the Eating Place

HOOD PROTECTS MINERS FROM FALLING ORE

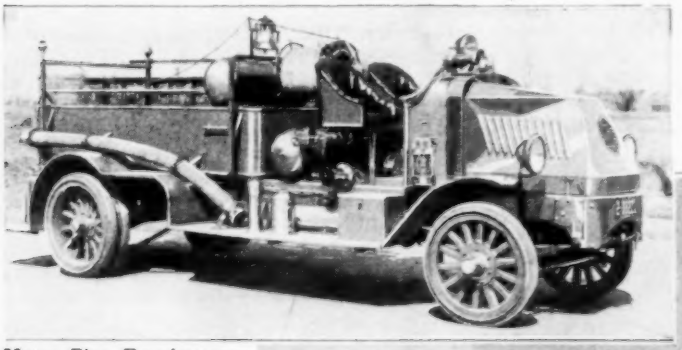
Protection from falling rock, or ore, spilled down the shaft from the skip when it is being dumped at the top of the headgear, is given men working in a northern Minnesota iron mine by a hood of sheet steel. This hood is placed at the mouth of the shaft and deflects anything falling from above away from the shaft. Miners using the ladder way are thus made safe from bombardment. Drawbars, which are opened only when the skip is at rest, guard the shaft mouth, while conspicuous warning signs are posted on the headgear. The shaft of this mine is lined with reinforced concrete as a fire-prevention measure.



Climbing the Ladder Way of This Minnesota Iron Mine is Not Attended with the Danger of being Struck from Above by Falling Rock and Ore, Thanks to the Hood at the Mouth of the Shaft

NEW MOTOR FIRE ENGINE HAS ROTARY PUMP

The familiar reciprocating-pump fire engine has remained standard, in spite of improvements in other pump forms, because of water-hammer and vibration difficulties when rotary pumps were used. A new type of motor-driven engine, however, has demonstrated the advantages of a properly designed rotary pump. Gear teeth that take in and discharge the water at the sides, as well as the ends, overcome squeezing effect, and consequent pulsation of the fluid. The bronze pump gears, instead of grinding each other, are driven by interlocked steel gears running in oil. Any water escaping from



Motor Fire Engine, with a Specially Designed Rotary Pump Instead of the Usual Reciprocating Variety

The Rotary Pump in Action, Demonstrating That Pulsation and Water Hammer have been Overcome and a Highly Efficient Fire-Fighting Unit Produced

the outlet side to the shaft is returned, by an ingenious groove system, to the suction chamber, which permits the use of low-pressure packing in the stuffing boxes, requiring less driving power. An efficiency of 83 per cent is claimed for the new pump, making a fire-fighting unit of unusual power and capacity, which should be practically trouble-proof.

GOVERNMENT REGISTERS WORD UNDER OWN TRADE-MARK LAWS

For the first time in its history the government of the United States has registered a trade-mark under its own patent-office laws. The word so distinguished is the familiar "Liberty" applied to airplane engines and parts. In connection with this unusual action it will be recalled that the engine was known as the "United States Standard Aircraft Engine" back in the experimental days of 1917. Workers in the Bureau of Aircraft Production, then the Equipment Division of the Signal Corps, were human, however, and so cast about for a nickname. "Liberty" was happily the word suggested, and adopted by general consent. But the name was later applied to a dozen different articles, including soft drinks and hamburger steaks, as well as commercial airplane commodities, with the result that the government has been forced to take this action to prevent confusion.

GOVERNMENT EXPERTS INSTALL SECRET CHEMICAL PROCESSES

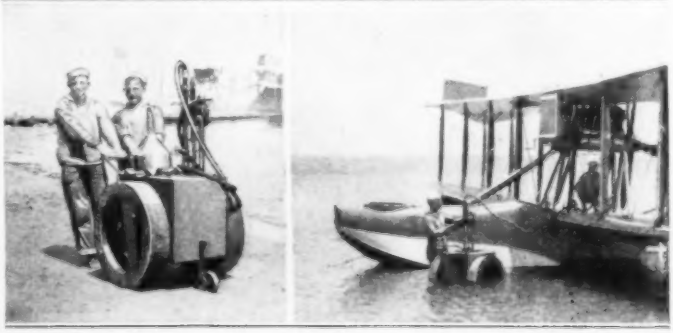
An attractive scheme for close-knit cooperation between the government and the chemical industries of this country has lately been announced by the Department of Agriculture. To plants desiring them will be assigned government laboratory experts familiar with certain newly discovered, cheaper processes for the manufacture of dyestuffs and medicinal preparations. These men will supervise the installation of the new systems, provided the manufacturer agrees to keep the processes a secret. The department will retain the patent rights for government and public use.

STEAM COOKERS MADE SAFE BY COPPER DIAPHRAGMS

Steam cookers used in the kitchens of a submarine base on the Pacific coast are prevented from exploding by a device of the utmost simplicity. When the cookers were made by sailors stationed at the base, it was found inexpedient to equip them with safety valves of the type used on steam-engine boilers, as is sometimes done, and another means of safeguarding the navy cooks was used. A hole was bored in the side of each cooker, and over these were soldered thin disks of copper. The soft metal diaphragms burst when the pressure becomes too high for safety.

SEAGOING FUEL CARTS USED AT SEAPLANE STATION

A wide-wheeled gasoline wagon for use on sandy beaches and shallow water has been developed at a naval seaplane station. The conventional type cannot be used when the seaplane is more than a few feet from the shore, because of the narrowness of the wheels. The new "wagon" with its wider wheels moves easily over the sand, however, and may be pushed through shallow water to the side of the plane. The reservoir is made waterproof by extending the air vent upward with a bit of copper tube.



By Extending the Air Vent Upward with a Length of Copper Tubing, and Attaching Wide Wheels, the Land Crew at a Naval Air Station has Developed a Fuel Wagon Which may be Pushed across the Sandy Beach and through Shallow Water to the Seaplane

OPERATING TABLE FOR HOGS INVENTED BY KANSAN

The chief difficulty encountered in administering anticholera serum to hogs—that of holding the animal while the fluid

Operating Table for Hogs: The Animal is Held in Proper Position for Inoculation by This Device, and Weighed at the Same Time

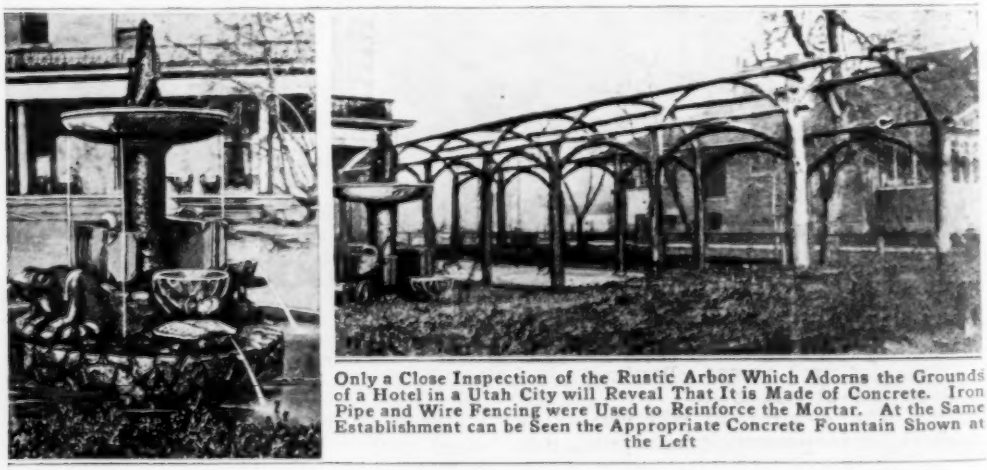
is injected—has been overcome, it is asserted, by an operating table recently invented by a Kansas veterinary surgeon. Besides holding a porker in the proper position for inoculation, the contrivance weighs the hog. It consists of a V-shaped trough, held in an inclined position by a collapsible steel frame; weighs 40 lb., and can be folded and carried on the running board of an automobile.

ABSORBENT MAKES ARMY MASKS PROOF AGAINST DEADLY GAS

On advice from the Bureau of Mines the government has repeatedly warned the public against the indiscriminate use of the army gas mask. It is peculiarly ineffective against the insidious carbon monoxide. But the bureau has now published the story of its widespread activities during the war; and therein describes the development of an absorbent for carbon monoxide which may be placed in the army canister. Twenty grams (a little over five drams) afford protection for one hour against an atmosphere containing one per cent of carbon monoxide. The problem previously baffled scientists for years.

RUSTIC CONCRETE PERGOLA ADORNS HOTEL GROUNDS

Many of the creations of the modern concrete molder are such excellent imitations of natural things that only a trained eye can detect the difference. On the grounds of a hotel in a Utah city there stands a rustic arbor that looks as if it had been made of the bark-covered branches of trees. As a matter of fact, the material is concrete, reinforced with metal. The upright posts were formed by imbedding iron pipes, wrapped with wire fencing, in mortar, while the crosspieces and longitudinal bars were molded around iron pipes. Finishing touches were put on by hand. Another feature of the hotel's grounds is a concrete fountain, on the base of which suitcases, frogs, fish, turtles, and other objects, are modeled.

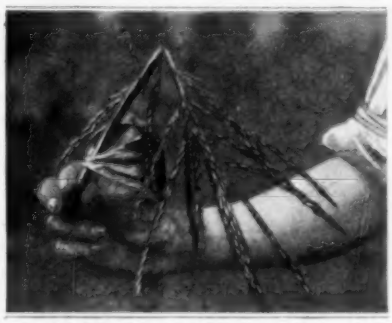


Only a Close Inspection of the Rustic Arbor Which Adorns the Grounds of a Hotel in a Utah City will Reveal That It is Made of Concrete. Iron Pipe and Wire Fencing were Used to Reinforce the Mortar. At the Same Establishment can be Seen the Appropriate Concrete Fountain Shown at the Left

Where the Dreaded European Corn Borer has been at Work, the Piles of Cornfield Rubbish, and Even the Ground, are Sprayed with Burning Oil, Drawn from a Machine Designed for This Particular Work

BLIND ROPE WORKERS PROVE SKILLFUL IN NEW FIELD

Blindness is not a handicap in work requiring skill in knotting and splicing ropes, it has been learned through an experiment conducted by a Pacific coast tent manufacturer. Because of the labor shortage during the war, this employer appealed to an institution for the blind for assistance, and was allowed to select a class for training. Only a few days were required to teach the students one of the most complicated knots, and within a week the blind employes were able to produce results equal to those of their teachers. Large ropes were used for instruction, the sensitive hands of the apprentices being passed over these in the several stages of the various knots until their fashioning became familiar to the beginners. As there is an increased demand by shipyards and airplane factories for labor skilled in this work, it is expected these fields will employ many blind persons.



The Stalks Infested by the Corn-Borer Pest are So Weakened That They Break Down of Their Own Weight

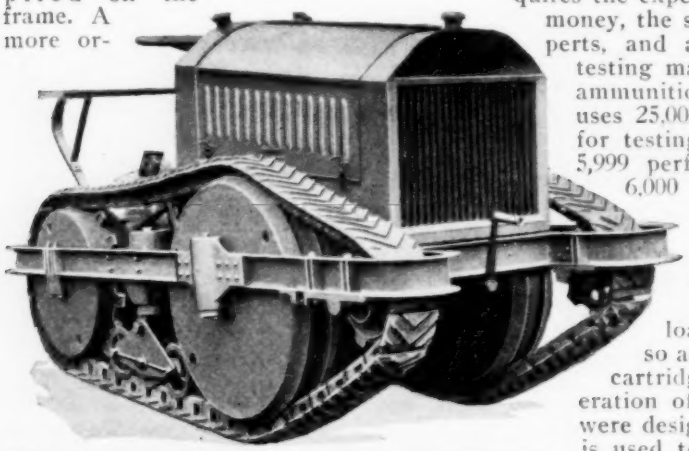
USE LIQUID FIRE AND STEAM TO KILL CORN-BORER PEST

Spreading rapidly, over Massachusetts and other New England states into New York State, and threatening the whole country, is an invading army of European corn borers—a grublike pest of appalling destructiveness. The commonwealth first named spent $50,000 in fighting the menace, and then called for Federal aid, and a government expert has devised a successful method of combat. All the infected ground, the stalks, and cornfield rubbish are sprayed with burning crude oil. A machine has been designed that covers a surface six feet wide with flame, though an ordinary power sprayer with a special nozzle, burning over about three feet, has been used with success. The liquid fire, reaching all the hidden interstices of the stalks, effectually destroys the borer. Another method, used with excellent results, is to pile the old stalks under a cover, and introduce live steam from a portable boiler.

Another Successful Method of Killing Borers in the Stalks is to Rake the Rubbish into Piles, Cover a Pile with a Canvas or Tarpaulin, and Then Admit Live Steam under the Cover from a Portable Boiler

TRACTOR HAS HOLLOW WHEELS FOR CARRYING BALLAST

When a farm tractor needs additional weight, logs and stones are generally piled on the frame. A more orderly provision is made by an Ohio machine, which stores sand or water ballast in its hollow wheels. The two main drivewheels and the large idlers will hold a good many hundred pounds of extra weight. Instead of being rigidly connected to the frame, the large idler wheels, as well as three small idlers, yoked together on each side, are hung on spiral springs inclosed in iron cylinders. The tractor has no differential, and is steered with planetary gearing which throws all the power onto one tread or the other.



The Rear Driving Wheels and Large Forward Idlers Are Hollow, and Hold Many Hundred Pounds of Sand or Water Ballast. The Cylinders at the Idler Hubs Contain Spiral Springs, Giving a Resilient Bearing

DETECTOR OF BAD COINS USES ELECTRIC EDDY CURRENTS

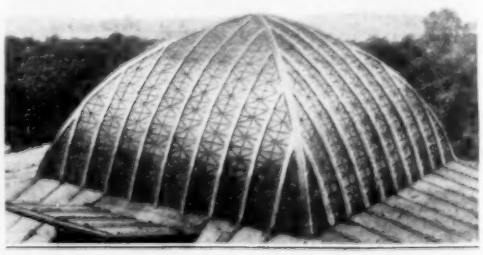
By virtually turning suspected coins into generator armatures, a mint official at Calcutta, India, is able to detect at least 90 per cent of the bad money among the pieces put through his machine, including honest coins containing splits or air bubbles. The coins are simply dropped into a hopper and rolled on edge down an incline, passing through a strong magnetic field. The rotating disks develop eddy currents whose strength is proportional to the purity of the metal. The descent of the coins is so retarded by the reaction of the currents that the genuine drop into one pocket and the spurious into another, farther on.

AMMUNITION TESTS REQUIRE MANY CARTRIDGES

To produce the nearly perfect small-arms ammunition of the present day requires the expenditure of much time and money, the services of an army of experts, and a vast array of accurate testing machines. One of the large ammunition factories in the East uses 25,000,000 cartridges each year for testing purposes. A record of 5,999 perfect rounds out of every 6,000 cartridges is claimed by this concern, which has in its arsenal over 1,000 rifles, revolvers, and other types of weapons. From these is fired one loaded shell after another so as to determine whether the cartridges permit the smooth operation of the arms for which they were designed. Electrical apparatus is used to measure the velocity of bullets and to discover whether there is any delay between the percussion of the primer and the explosion of the powder. Tests are made to ascertain whether ammunition produces accurate results, to learn whether primers are oversensitive or the reverse, and to determine whether powder has been compressed properly.

"TOWER OF JEWELS" GLASS IN GREENHOUSE DOME

Pieces of glass that once sparkled in the "Tower of Jewels," one of the spectacles of the Panama-Pacific Exposition at San Francisco in 1915, are now serving in the dome of a tropical-plant greenhouse in a California city. There are 1,400 pieces in the transparent roof, most of them triangular in shape. The glass



This Dome on a California Greenhouse is Made of Glass Taken from the "Tower of Jewels," One of the Sights at the Panama-Pacific Exposition

s thicker than that ordinarily used for such purpose, and each piece is beveled at the edges. Shades inside the dome regulate the amount of sunlight admitted to the conservatory.

TURN FAMOUS OLD WARSHIPS INTO TARGETS AND JUNK

In the navy the course to obsolescence is not long, and 15 years brings many changes. That long ago, the might of the American Navy was represented by a fleet of twelve splendid ships which are going today to the targets and the junk yards. Four of them, the "Oregon," the "Iowa," the "Indiana," and the "Massachusetts," helped win the Spanish war. The others—the "Kearsarge," "Kentucky," "Alabama," "Illinois," "Wisconsin," "Ohio," "Missouri," and "Maine"—were launched a few years later, and all joined in the world cruise of 1907. In the great war the old ships performed their last service, in training and coast-defense work. Now the "Oregon" has been offered to its name state for a museum or training ship, the "Iowa," "Massachusetts," and "Indiana" will be wrecked for their parts, and the rest will become either junk or targets for trying the guns of younger ships.

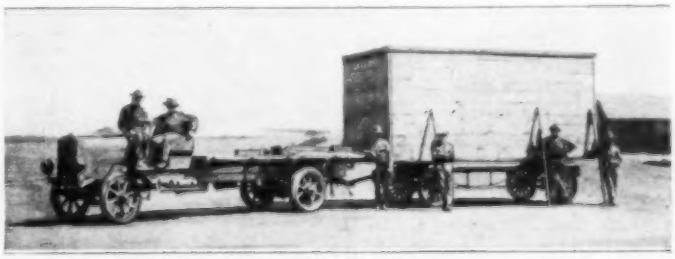
SAFETY EXITS FROM ARSENAL LEAD DOWN SMOOTH CHUTES

Alongside the open stairways leading to the second floors of various buildings at an eastern arsenal, are what appear to be duplicate flights wholly incased in metal runways. The covered structures, however, are not stairs, but chutes, with floors of highly polished hard wood. The apartments from which they open are the measuring rooms of the arsenal's gas-filling plant. A quick exit from these quarters might, under certain circumstances, be quite desirable, and the chutes afford the means for an almost instantaneous, but easy, descent.

The Structures That Angle up the Sides of the Buildings Look Like Covered Stairs, but They Are Not. They Are Metal Chutes, with Hardwood Floors, for Quick Escape, if Necessary, from the Gas Rooms of the Arsenal

OLD AIRPLANE BOX MAKES EMERGENCY DARK ROOM

Just two hours after the overtaxed photographic department at a large aviation field called for additional dark-room space, an old airplane crate was ready for business in that capacity. Soldier-mechanics lined it with black paper to make it light-proof, provided for ventilation with an electric fan and a hole in the ceiling, roofed it with tar paper, swung a door in one side, built benches along the walls, and finally fitted it with two old sinks, and provided facilities for running water.



This Old Airplane Crate was Transformed within Two Hours into a Complete Photographic Dark Room, Light-Proof, Water-Tight, Automatically Ventilated, and Equipped with Benches and Running Water

CIVIC FEATURES THAT PROMOTE THE COMFORT

A Scene in Kenilworth, One of Chicago's Delightful Suburbs: The Town Lies North of the City, on a Bluff Overlooking Lake Michigan. Depicted Here Is a Street of Concrete, and a Bridge of Rough Stone, Built to Harmonize with Its Natural Surroundings. On the Pillars Are Artistic Lamps

Introducing "Buster," the Canine Mascot of the Chamber of Commerce, Sacramento, California, Campaigning for Votes for a Bond Issue to Build a Municipal Filtration Plant

In the Center of Anaheim, California, Is a Lofty Steel Flagstaff, Which Serves Not Only to Display the Stars and Stripes, but to Regulate Traffic

Built and Furnished with Funds Raised by Women, This Attractive Bungalow, near Phoenix, Arizona, Is the Scene of Rural Social Functions, Arranged by Farmers' Wives and Daughters

AND ENJOYMENT OF VISITORS AND RESIDENTS

Community Canning is Approved in a Practical Manner by the Women of Asheville, North Carolina, Who Gather in This Well-Lighted, Completely Equipped Kitchen, Built over a Public Fountain, to Can Fruits and Vegetables. Water for Washing the Products is Supplied by a Pipe from the Fountain

Each One of the Wreath-Adorned Markers around a Monument to the Heroes of 1861-65 in Elkhart, Indiana, Represents a Citizen Who Died in the World War

As Permanent as the Milestones of Another Age, These Inexpensive Concrete Road Markers, with Indented Lettering, are Becoming Plentiful in Some of the Southern States

Though Horses are Fast Disappearing from the Streets, Residents of Pasadena, California, are Not Neglecting the Few Faithful Beasts Still Competing with the Automobile, as is Shown by This Beautiful Drinking Fountain

FILLING-STATION FOUNTAIN SERVES COOL DRINKS

Not only can motorists replenish their supplies of fuel and lubricants when they stop at an attractive filling station in a California town, but they can refresh themselves with cooling drinks or ice cream, served by the same young woman who attends to the gasoline and oil pumps. A soda fountain was installed in the station by this young woman, the owner, who rightly judged that soft drinks should be as much desired by hot and dusty tourists as provisions for their cars.

Gasoline, Oil, and—Soft Drinks are Sold at This California Filling Station, Which is Owned by a Young Woman

MEMORIALS TO JAMES WATT PLANNED BY SCIENTISTS

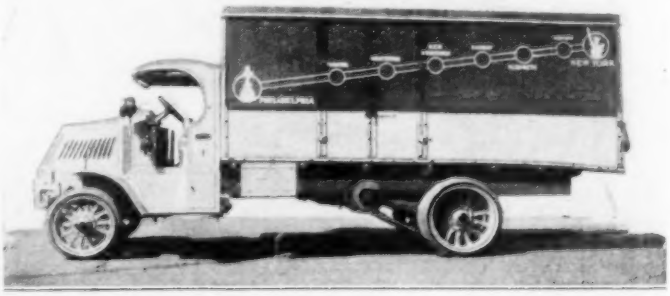
Plans for establishing lasting and practical memorials to James Watt were considered by a number of British scientific and engineering organizations at a representative meeting held some time ago in Birmingham, to devise ways to celebrate the centenary, August 19, of the Scottish inventor's death. One phase of the tentative arrangements provides for the erection of a building to be used as a museum for examples of the work of Watt and his contemporaries. It also was proposed to publish a memorial volume and to endow a professorship of engineering at the University of Birmingham in his honor.

STRIKING FOG-HIDDEN POLE, PLANE TUMBLES TO BEACH

Two army airmen recently escaped serious injury by a miracle while making the last leg of a recruiting flight from Texas to Minnesota, Illinois, and the eastern states. Running into a thick evening fog while flying above Rockaway Beach, L. I., they circled down to get their bearings. As they swooped over the beach, a wing of their airplane collided with a 100-ft. flagpole, twisting the machine into a nose dive. Airplane and airmen crashed together upon a mud flat left bare by the receding tide. The pilot crawled from beneath the wreckage; his passenger was pinned to the ground and had to await the arrival of a rescue party from a nearby hotel. The machine was covered and probably ruined by the rising tide.

DIAGRAMS ADVERTISE ROUTE OF EXPRESS TRUCKS

Diagrams painted on the sides of trucks, operated by a motor-express company between two large eastern cities, give full information of the route followed and the stops made on the run. Large circles at either end of a double line running diagonally across the side of each truck represent the terminal cities, while smaller circles, at intervals between, indicate intermediate stops.



A Glance at This Truck, Which Is One of a Fleet Operated by a Motor-Express Company in the East, Tells Where It is Going and Where It will Stop. The Diagram and Its Details can be Seen at Considerable Distance

CITY ERECTS MEMORIAL LAMPS TO SONS WHO WENT TO WAR

At the intersection of two busy streets one municipality has voted to erect by public subscription four useful monuments to its boys who went to war. On each corner will be placed a bronze column, bearing a lamp, and supported by a heavy granite base. On four bronze tablets, which will sheath the upper part of the base, will be engraved the name of every soldier and sailor. The memorial lamps were designed by a local artist and will cost $2,000 each.

DESIGNED BY EDWARD E. HENDERSON

On the Corners of a Busy Street Intersection will Stand Four of These Bronze Columns, Memorials to the Local Men Who Went to War

RANCHMEN HUNT RATTLERS WITH CAVALRY SABERS

Killing rattlesnakes with cavalry sabers may not appeal to some as a gentle sport, though undeniably thrilling; yet ranchmen of Owens Valley, in eastern California, spend much of their spare time in its pursuit. The paramount object, naturally, is to get rid of the rattlers, and the saber has been found an ideal tool for that work. Armored in heavy boots and gloves, the hunter beats the bush until he hears a snake signal, and then proceeds to excite the reptile until it strikes. A stroke of the blade then ends its venomous career in mid-air. Equipped with a job lot of old sabers, 22 men thus slew 72 of the serpents on one trip.

LANDING ON FIELD TOO SMALL, PLANE CRASHES INTO CROWD

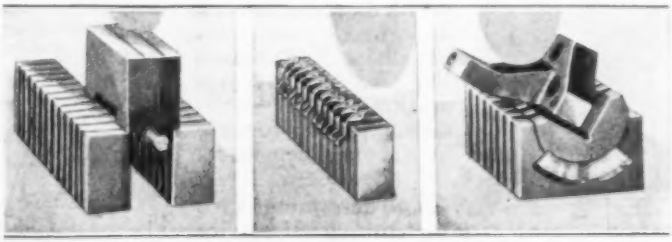
Attempting to make a landing on a field too small for his heavy plane, a Victory-loan flier at Forest Park, St. Louis, smashed through the guard cable about the field, and the machine, nosing over into the crowd, injured three persons seriously, and several others more or less severely. The pilot, who was uninjured, was driving a German Fokker biplane as part of the flying circus touring the country for the last Liberty loan. An experienced airman, he had already made one unsuccessful effort to land in the insufficient space, "zooming" over the heads of the crowd and circling the field again in a stiff and changing wind. For safety to observers as well as fliers, it is obvious that a definite minimum figure for landing-space area must be provided, and such space must be kept clear, for there are no brakes on an airplane.

SHARK HIDE EMPLOYED TO POLISH DIAMONDS

The hard outer coating of the shark has been found to become so hard after exposure to the air that it will scratch diamonds. So, some of this material is now ground into powder, and used for diamond polishing in place of the diamond dust commonly employed.

USES OF MAGNETIC CHUCKS INCREASED BY DEVICE

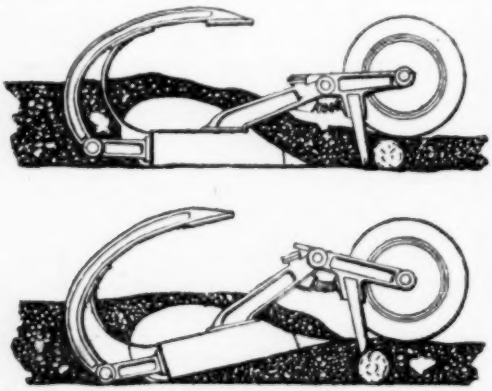
Designed to hold pieces of irregular shape for grinding at unusual angles, an attachment for magnetic chucks has been found to multiply the uses to which that device may be put. In its simplest form the attachment is a block made up of alternate plates of steel and insulating material, so arranged as to correspond with the laminations of the chuck. When in use, the attachment is placed on the chuck and is magnetized by conduction. There are several types of the attachment, including a protractor type, with a flat, plane, and V-block surface bar; a V-block type, and a plane-surface type. Each of the several types is made in a number of different sizes.



In Principle an Extension of the Magnetic Chuck, the Attachment Shown Here Provides a Variety of Surfaces upon Which Pieces of Irregular Shape may be Placed for Grinding. Several Sizes of the Different Types are Made

HINGE IN BEAM ENABLES PLOW TO JUMP OBSTRUCTIONS

The "stump-jumping" plow has appeared to gladden the farmer's heart.



The Two Diagrams Show How the Hinged Plowbeam is Jackknifed by the Coulter, Enabling the Point of the Share to Ride over Obstructions

The beam is hinged between coulter knife and plowshare, with a heavy coil spring placed between the two to keep them alined under normal conditions. But when the coulter knife encounters a stump or heavy root it is forced back, the beam jackknifes, and the plowshare rides over the obstruction.

NEW AUGER BIT SMOOTHS HOLE WHEN WITHDRAWN

Holes free from splinters are bored by an auger bit that has been patented by a western inventor. At several points on the upper side of the spiral of this bit are sharpened nibs, similar to those at the cutting end of an ordinary tool of this type. These come into action when the bit is withdrawn from a hole, cutting away inequalities and slivers left after the first operation. The bit is recommended for use in wet or green wood.

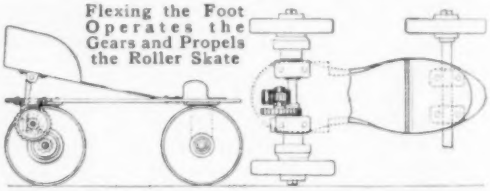
¶To determine the possible value of a meteorological service for cross-country flying, the Army Air Service offers to make a 30-hour forecast for any airman intending a long flight.

LOCKING SYSTEM FOR DOORS PROTECTS DELIVERIES

Double doors which lock alternately are the invention of an American living in England. The system permits packages to be left at a residence during the absence of the occupants, or without disturbing them if they are present. When the outer door is opened, the inner door, which leads to the rooms of a house or apartment, is locked automatically. Shutting the outer door and turning the knob unfastens the inner door and locks the outer. By opening and shutting the inner door, the outer is unlocked. Pockets for parcels are placed on the inside of the outer door.

ROLLER SKATES PROPELLED BY RIDER'S WEIGHT

The novice on roller skates is apt to think they run easily enough without mechanical assistance. For the sophisticated, however—which includes most children—two Oregon inventors have provided a new thrill. On each skate they have placed a spring heel plate, which, as it ascends and descends, operates gearing that turns the rear wheels. Mere



Flexing the Foot Operates the Gears and Propels the Roller Skate

flexing of the foot as in walking, therefore, drives the skater forward at considerable speed, the free-running wheels needing only an occasional impulse.

A CROQUET ARCH VISIBLE IN TWILIGHT

A novel croquet arch that can be easily seen has been invented by an army colonel. Instead of a curved arch there is a block of wood with a large hole in the center toward which the ball is directed. The blocks are usually painted a dark color and the open space makes the arch always visible. The base seen in the illustration serves only as a temporary mounting for demonstration purposes.

MILDEW-PROOFING PROCESSES TESTED IN LABORATORIES

Tent canvas, which has been treated by some mildew-proofing process, can be tested in laboratories by a method recently devised by scientists. Disks, about $3\frac{1}{2}$ in. in diameter, are cut from the cloth to be examined and soaked in running water for two or three days. They are then placed in plates containing agar jelly and incubated in a darkened room with a temperature of from 68 to 77° F. for three weeks or a month. Each week the disks are examined and their condition noted. The resistance against fungous growths of materials treated by different processes is thus established, and the value of each process is rated at from 1 to 10, according to its effectiveness. Thus, for instance, canvas treated by a process rated at 6, successfully withstands weather conditions at Washington, D. C., without mildewing.

COLLARS IRONED WITH HUMAN SKILL BY IMPROVED MACHINE

Laundrymen have long used a curved plate with a self-heating, grooved iron for smoothing the folded edge of linen collars so that they will not irritate the neck. An improved machine has now appeared, however, in which clever mechanical design takes the place of the human skill formerly required. As the operator rotates the iron a ball-bearing roller on a cam-like track carries it gently onto the collar, and, after the edge has been ironed, off the collar and out of the way. A coil spring maintains the proper pressure throughout the single back-and-forth motion necessary for the operation.

ADVERTISING ON OCEAN FLOOR SEEN THROUGH GLASS BOTTOMS

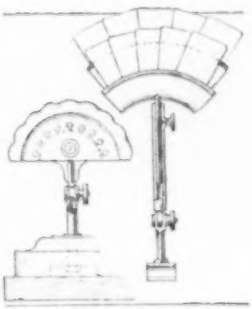
The submarine gardens about Santa Catalina Island, Calif., have been made famous by the glass-bottomed excursion boats which travel the waters above them. And there are fish to be seen, thousands of splendid game fish. The tourist is exceptional whose hand fails to itch for a fishing rod as he peers down at them. A local merchant has turned this impulse into cash. He has placed a "signboard" on a sandy stretch under 30 ft. of clear

As the Tourists Peer through the Glass Bottom at the Famous Submarine Gardens Their Glance Encounters a "Signboard" Placed Flat on the Ocean Floor

water in the path followed by many of the glass-bottomed craft. Glancing from the fish to the sign, tourists read that "These Fish Bite like Hungry Wolves if You Use Blank's Prepared Bait." The novel practice is restricted to several sandy bottoms and is prohibited in the more beautiful of the submarine gardens.

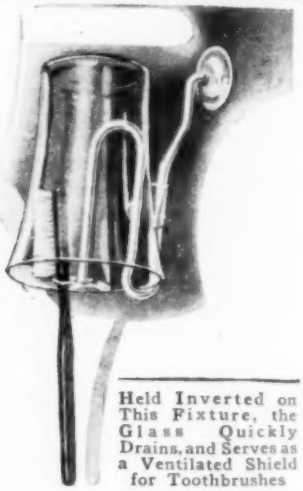
HOLDER FOR PLAYING CARDS PATENTED IN FRANCE

Even card players have been given attention by the inventor of a labor-saving device. The contrivance intended for their use is a holder for each player's "hand" recently patented in France. It consists of two semi-circular plates, between which the cards are held by friction, mounted on a support which can be adjusted as to height or tilted backward or forward. A clamp fastens the holder to a table.



SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

The Noncorrosive Metal Handle of This Toothbrush Serves as a Sanitary Case for the Bristle-Set End

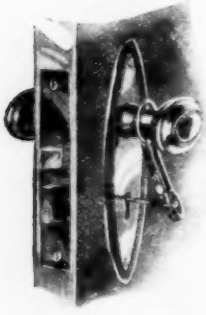


Held Inverted on This Fixture, the Glass Quickly Drains, and Serves as a Ventilated Shield for Toothbrushes

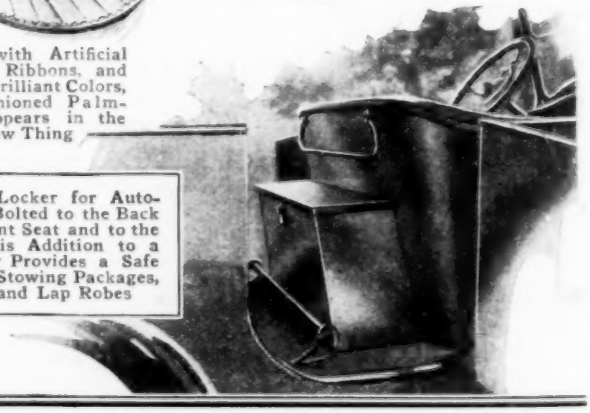
Glass Lemonade and Iced-Tea Spoons Have Long, Hollow Handles Which Serve as Straws

Many Uses can be Found for This Book Holder, Which is Designed to be Clamped on the Arm of a Chair, on a Stove, or on Other Household Fixtures. Its Joints Permit Adjustments to Meet the Requirements of a Reader, No Matter What Piece of Furniture It is Attached to

Bedecked with Artificial Flowers and Ribbons, and Enameled in Brilliant Colors, the Old-Fashioned Palm-Leaf Fan Appears in the Stores as a New Thing of Beauty



This Simple Device Prevents a Skillful Burglar from Unfastening a Door by Turning the Key with a Pair of Pincers, Working from the Outside. It can be Easily Detached from the Knob and Key

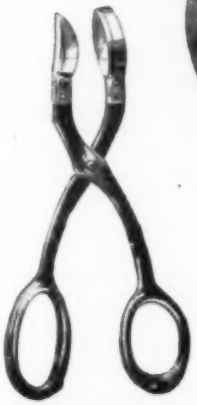


Tonneau Locker for Automobiles: Bolted to the Back of the Front Seat and to the Floor, This Addition to a Motor Car Provides a Safe Place for Stowing Packages, Tools, and Lap Robes

INTENDED FOR THE HOME AND ITS MEMBERS

Musicians Acquire Flexible Hands by Using the Device Shown at the Left. When the Fingers are Placed in the Rests Provided for Them, and the Hand Pushed Forward, the Digits are Extended Fan-Wise

For Packing in a Suitcase or Traveling Bag, This Walking Stick can be Folded to Half Its Length. A Jointed Metal Rod, Which Slides inside the Body of the Cane, Makes This Possible. The Two Sections are Threaded to Screw Together

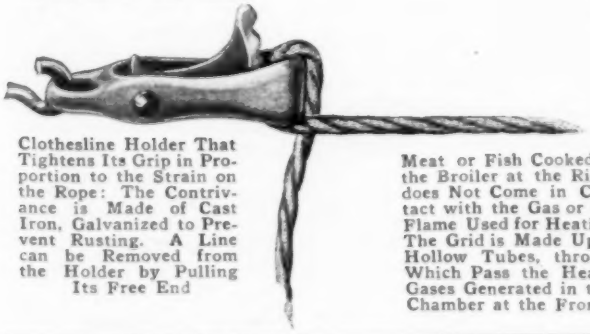


Shears for Removing Pineapple Eyes: The Blade is Inserted under the Eye, Which is Cut Out by the Sharp-Edged Ring

Useful in the Home for Blacking Stoves, Cleaning Clothes, and Other Purposes, the Fountain Brush Shown Here can be Used Elsewhere for Cleaning Type, Polishing Automobiles, or Stenciling. The Liquid is Contained in the Hollow Handle, and Fed to the Bristles through a Thumb Valve

Shaped to Fit the Edge of a Pot, and to Cover Nearly Half Its Top, a New Strainer of Perforated Sheet Metal Has a One-Piece Wire Frame and Handle, and is Intended for Use on a Cooking Vessel of Any Size

With This Belt around Its Waist and the Side Straps Fastened to the Arms of a High Chair or Perambulator, a Baby is Insured against Falls

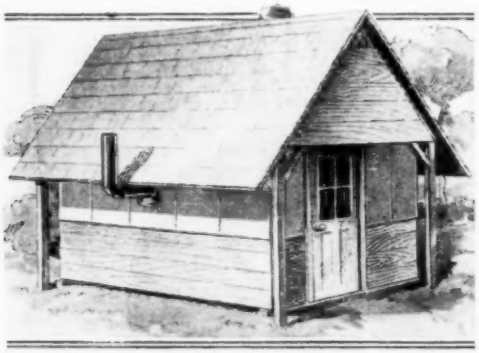


Clothesline Holder That Tightens Its Grip in Proportion to the Strain on the Rope: The Contrivance is Made of Cast Iron, Galvanized to Prevent Rusting. A Line can be Removed from the Holder by Pulling Its Free End

Meat or Fish Cooked in the Broiler at the Right does Not Come in Contact with the Gas or Oil Flame Used for Heating. The Grid is Made Up of Hollow Tubes, through Which Pass the Heated Gases Generated in the Combustion Chamber at the Front of the Broiler

SHINGLED ROOFS MAKE TENTS COMFORTABLE COTTAGES

Tents are made to serve as comfortable living quarters during the entire year, at



Adding Shingled Roofs, Wooden Walls, and Floors to Tents Makes Them Comfortable in All Kinds of Weather. Doors and Windows Are Other Improvements

a southern California mountain resort, by covering them with shingle roofs and adding wooden walls and floors. Ordinary wall tents, 9 ft. 4 in. by 11 ft. 8 in., with 3-ft. walls, are pitched over frameworks of small timbers so that the canvas walls overlap the wooden walls several inches. Gabled roofs are then built over the tents. These are supported by posts so that there is an air space of 1 ft. between the roofs of the tents and the shingles. Frames at either end of the tents hold doors and windows. In cold weather the tent-houses are heated by stoves.

DYNAMITE COMPLETES CANAL WHEN DREDGE STOPS

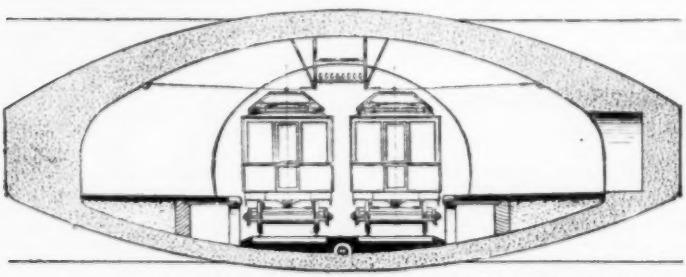
Dynamite rapidly completed a canal that connects the Atchafalaya River with Bayou Teche and the Vermilion River, in Louisiana, when urgent demands for water to save the rice crops along the latter stream made quick action necessary. Dredges were within 500 ft. of the end of the ditch when a shortage of labor halted the work. Holes were made with iron pipes in the soil, along the line on which it was desired to dig, and in these were placed the explosive. After the holes had been filled with earth, which was thoroughly tamped, the charges were exploded. The result was a canal, 12 ft. wide and 4 ft. deep. It would have required several days for a dredge to complete the canal.

MADRID SUBWAY LINE ABOUT TO BE OPENED

By GEORGE E. PAUL

MADRID is anxiously awaiting the day when the first of the four lines that are to form its modern subway system will be formally opened for public service. For many years there has been a strong and insistent demand for such a system, to help clear the streets of the immense rush-hour throngs. This crowding is at its worst in the great plaza, the Puerta del Sol—the very heart of Madrid. The principal street-car lines of the capital start from this point, and eleven wide thoroughfares discharge their crowds into it. At the evening hours, especially, a jam of people is trying to cross it.

Plans to relieve the congestion, formulated by Spanish engineers and approved by the city council some years ago, called for a system of underground railways, consisting of four lines, of which the first is now nearing completion. This line, in two sections, is about three miles long, and extends from Puerta del Sol, practically north, to Cuatro Caminos, the city limits, where large shops are located. The first section, from Puerta del Sol to Glorieta de Bilbao, a small park about halfway to Cuatro Caminos, runs at a depth of some 60 ft. below street level, in order to avoid the various municipal service pipes, while the second, from the glorieta to Cuatro Caminos, averages only a few feet be-



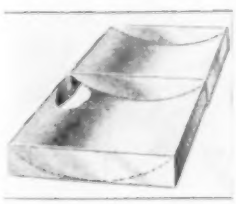
Cross Section of the New Double-Track Subway being Constructed in Madrid, Spain, Indicating the Arrangement at Stations, Where the Platforms Are 10 to 14 Feet Wide

low the ground. The whole line is double-tracked, and the gauge is the same as that of the street railways. The maximum grade is only four per cent, and the sharpest curve has a minimum radius of 300 ft. The stations are of uniform length, about 200 ft., with platforms on either side, from 10 to 14 ft. wide. Five-coach trains, accommodating some 400 passengers, will run on a 2½-minute schedule in both directions, thus affording service to a maximum of 9,600 passengers per hour either way. The stations, walled and arched with white tile and presenting a very attractive appearance, are now finished except for some interior and exterior decorative details, and the tunnel itself is expected to be completed before October this year.

In view of the excellent progress made on this first line, the city council has considered it advisable to continue it southeastward, so that it would extend also from Puerta del Sol to the Glorieta de Atocha, facing the Mediodia (southern) railway station. When completed, this greater line, about four miles in length, would cross the capital from north to south and, by a 15-minute run, connect Cuatro Caminos with the populous southern quarter of Madrid and with the intense traffic of the Mediodia station. It is believed that the completion of the subway system will have a powerful effect in developing the many attractive suburban districts that are spreading out in all directions from the thriving capital.

METAL DESK TRAY TELESCOPES TO FIT DRAWER OF ANY SIZE

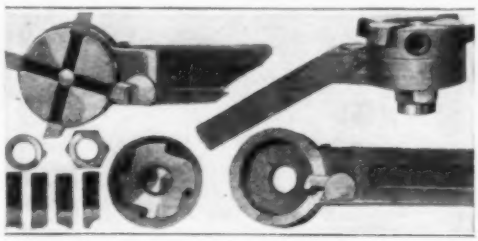
Business folks will value a telescoping metal tray which may be adjusted to fit a drawer of any width. Numerous partitions divide it into sections for clips, stamps, rubber bands, and other necessities. A hole is punched in either end through which a thumb tack may be thrust to hold the tray in position.



¶Several "Yeomanette" posts have already been established as precursors of many women's posts and auxiliaries, soon to be organized and affiliated with the American Legion.

IMPROVED LATHE-TOOL HOLDER CARRIES FOUR POINTS

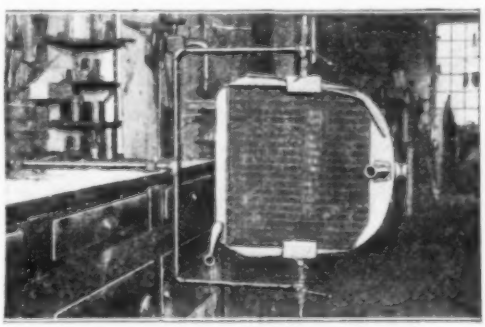
When a piece of work in the lathe requires from two to four operations, a new form of tool holder is calculated to save considerable time. The head of the holder carries a turret, which is revolved to bring forward any one of four tools which it holds. The sockets of the tools admit bits ⅜ in. square, the shank of the holder itself being 1¼ by ⅝ in. The turret, ground to fit its seat in the shank, is locked, unlocked, and indexed with a wrench which accompanies the holder. Screw adjustment up to ¼ in. takes up the wear of the cutting points.



Upper Left, Side View of Turret with Its Four Tool Points; Upper Right, Top View of Holder. Tools, Turret, and Shank are Seen Disassembled Below

CLAMP FOR WORKBENCH HOLDS ANY AUTOMOBILE RADIATOR

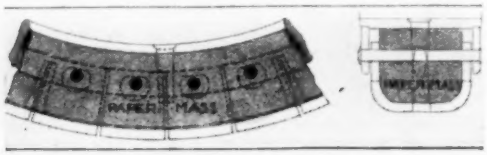
The proprietor of an auto-repair shop in Iowa has invented a workbench clamp that will hold firmly an automobile radiator of any size. A bracket of square Y-shape, made of ¾-in. steel tube, has its stem screw-clamped to the bench. The end of each arm is split, normally held closed by a sleeve, and clasps a transversely sliding corrugated rod, with a clamp for the side of the radiator.



Workbench Clamp of Steel Tubing, Adjustable to Hold Firmly an Automobile Radiator of Any Size or Make

PAPER MOTOR-TRUCK TIRES HAVE METAL TREAD

Paper tires for motor trucks are a recent European invention. Shaped somewhat like the regulation solid-rubber tire,

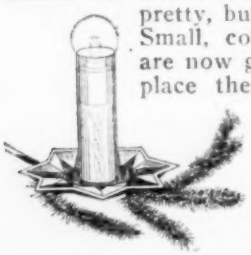


Sectional Views of Metal-Protected Paper Tire: To the Left Is a Longitudinal Section, and to the Right a Cross Section

a mass of paper is firmly attached to the rim of the wheel and covered by numerous stirrups, which form a protective metal tread. The ends of these stirrups fit inside the flanges of the rim and are held there by rivets which pass through large holes in the stirrup ends, as well as through the flanges and paper. This construction permits compression of the paper at the point where the tread is in contact with the road.

METAL CANDLESTICKS REPLACE TAPERS ON CHRISTMAS TREE

The wax candles which tradition demands for the Christmas tree are very pretty, but equally dangerous. Small, colored electric bulbs are now generally used to replace them, but are seldom satisfactory from an artistic viewpoint. The little holder in the illustration will do much to restore the illusion, however, with a lighted bulb atop its white column. Numbers of them are secured to the boughs of the tree, where they look much like twinkling tapers.

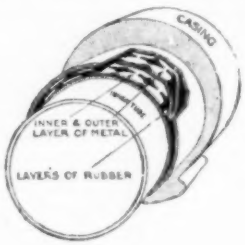


TEST WATERPROOFED LEATHER BY SCIENTIFIC METHOD

The relative value of various sole-leather waterproofing materials can be accurately determined, it is declared, by a scientific test described at a recent meeting of chemists in Buffalo, N. Y. This test is begun by immersing several pieces of leather of the same tannage and from the same section of the hide, but of varying texture, in different waterproofing liquids, heated to 140° F., and then warming them in an oven of the same temperature. The pieces are then soaked in water for 24 hours, during which time they are bent frequently to encourage absorption. By weighing each piece before and after its treatment with the waterproofing liquid, and immediately after it has been soaked in water, as well as after it has been air-dried, figures are obtained on the amount of waterproofing liquid taken up and the quantity of water absorbed by the treated leather.

METAL-ARMORED INNER TIRE NEW AUTO ACCESSORY

Another invention for reducing the cost of operating automobiles has been offered to motorists in the form of a metal-armored inner tire. It consists of an outer covering, impregnated with graphite for lubrication, and inclosing three layers of rubber, between which are placed two strips of perforated metal. The tire lining is a fabric treated in the same manner as the covering material. The appliance is intended to shield the inner tube from sharp objects which penetrate the outer tire, and to reinforce the walls and tread of the casing.



NEWEST WAY TO CLEAN RIFLE: SHOOT BRUSH THROUGH IT

If not the simplest, at least the quickest method of cleaning a rifle is by shooting a brush through it. An English inventor has patented such a brush, made of fine steel wire, designed to fit into a cartridge like a bullet, and about the size of one.

¶As a measure against the spread of typhus in Poland, the government of the new nation recently issued orders that every man, woman, and child in the country should have the hair shorn from their heads, and that baths be taken by all. There were 100,000 cases of the dreaded disease in Poland when the extraordinary edict was published.

FRANCE WOULD AWARD MEDAL TO ALLIED FIGHTING MEN

The French government proposes a step that is perhaps without precedent in the history of nations. To every soldier and sailor of the countries allied against the central powers, and with at least three months' fighting service, she would give a "Victory Medal." The proposed decoration is of bronze, measuring about one inch and a half in diameter. On one side appears a winged figure of Victory with no inscription; on the other is printed the words, "The Great War for Civilization," with the name of the allied nation to which the bearer belongs. The ribbon displays a double rainbow on a red ground with white edges.

ELECTRICAL GLASS SPLITTER USES HEATED RIBBON

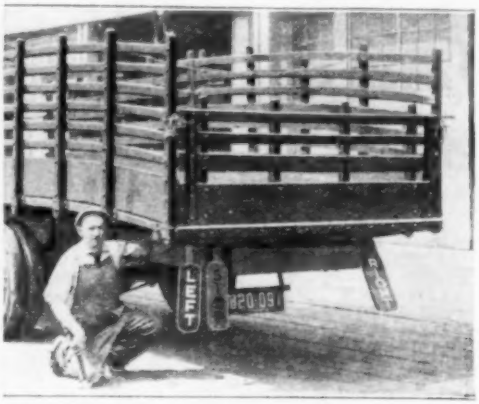
A simple electrical tool for splitting glass cylinders or cutting sheets of the same material has been patented by an Ohio man. It consists of a narrow rib-

Glass is Split by This Tool through the Application of a Ribbon Heated by Electricity. A Spring Stretches the Ribbon over the Frame of the Device

bon of high electric resistance, which becomes intensely hot when used as a conductor. Applied to the surface of glass when heated, the ribbon splits the brittle substance. The ribbon is stretched over asbestos placed in a channel in the iron frame of the tool, and is held taut by a spring at one end. Current flows into the ribbon at the handle end of the frame through an insulated terminal block, and returns to the other terminal, which is grounded.

SIMPLE SIGNALING DEVICE PLACED ON TRUCKS

Of the numerous traffic-signaling devices for motor vehicles, probably none is as simple as the one that is being placed on the trucks of an eastern contracting concern. Three differently colored slabs of wood, on which are painted the words "left," "right," and "stop," in large letters, are hinged underneath the truck body at the rear. Attached to the free ends of these slabs are cords which terminate in leather straps near the driver's seat. When the course of the machine lies straight ahead, the signal boards are drawn up out of sight. If a turn or a

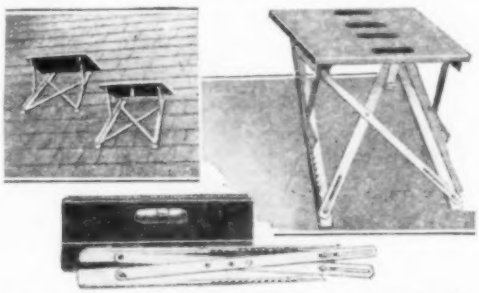


Traffic-Signal Boards Hinged underneath a Truck Body at the Rear are Operated by Cords Leading to the Driver's Seat

stop becomes necessary, the proper board is swung down by releasing one of the straps.

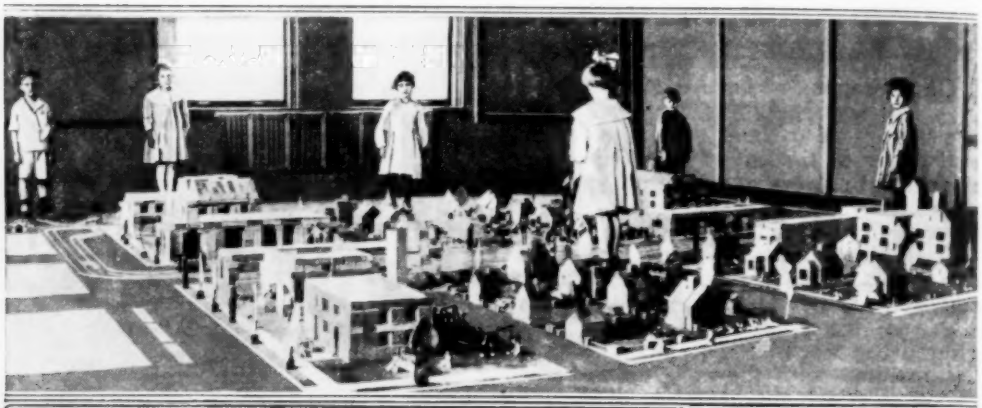
ADJUSTABLE ROOF BRACKET FOLDS FOR SHIPMENT

For use by carpenters, painters, and brickmasons on sloping roofs, a folding bracket seat, invented by a western man, has been patented and is making its appearance on the market. Not only is the device capable of being collapsed for carrying or shipping, but it can be adjusted to provide a level seat regardless of the pitch of the roof on which it is used. Two of the brackets can be used for supporting a scaffold between them if placed at

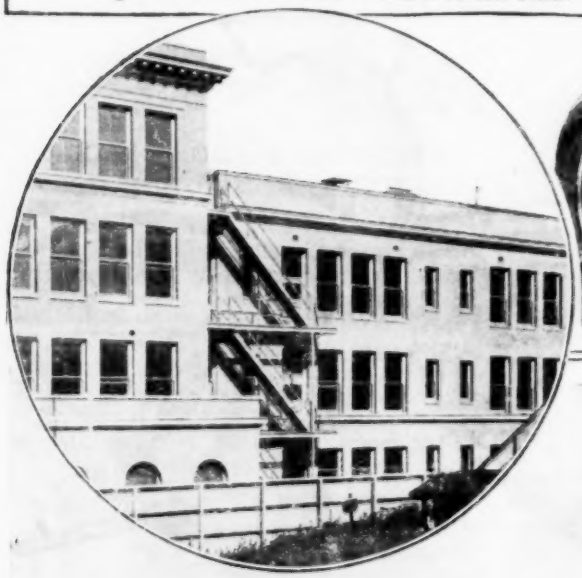


Adjustable to Provide a Level Seat on Any Sloping Roof. This Bracket Seat can be Folded and Locked for Shipment

the same level on the roof, or several brackets, placed one above the other, form steps on the roof. When the appliance is folded the wooden seat becomes a case for the metal supporting frame, and can be locked for shipping.



Using "Blocks" for the Erection of the Buildings, Tissue Paper for Lawns and Trees, and Chalk Lines for Railroad Tracks, Kindergarten Pupils Built This Model City. As They Walk Slowly through the Tiny Streets Their Teacher Instructs Them in the Simple Rules and Safeguards That Govern Pedestrian and Vehicle Traffic



This Bear Cub Considers Himself a Better Mascot Than the Kewpie Doll or Ornamented Radiator Cap. He Prefers to Ride in the Back Seat, but the Hood Is Acceptable

The Roof of This Public School in San Francisco's China Town has been Walled In to Form a Playground. Here the Oriental Boys and Girls Assemble to Learn the Health-Giving American Games. Led by White Teachers, They Soon Outgrow Their Shyness, but Never Their Quaint Courtesy. No Matter How Excited, the Chinese Boy Lifts His Hat before Addressing a Teacher. As Seen in the Upper Photo, the Playground Is High Enough above the Street to Escape Its Dust and Grime

Mitzi May Kuntz, Eight-Months-Old Resident of York, Pennsylvania, Started to Fly a Little Early in Life; but She Wanted to Break the World's Record for Youthful Airplaning, and So Flew 40 Miles with a New York Aerial Policeman

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England, Birthplace of the Boy Scout Movement, Now has Started the Sea Scouts, an Organization That Did Useful Work during the War. The Scout on the Left, One of the Oldest in the Service, Saw Three Years of War and was Torpedoed; the Other Boy has Been a Scout for One and One-Half Years

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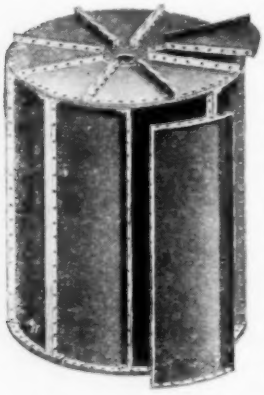
A Biplane Driven by Velocipede Power Only Needs a Normal Amount of Imagination to Make It Soar Away into the Clouds, and with Its Appropriate Air Gun the Young Pilot can Clean Up All the Germans in the Sky

BY COURTESY OF THE SPHERE, LONDON

An Australian Photographer Lay in Ambush for Two Hours to Get This Rare Picture of a Wild Kangaroo, with Its Young One Conventionally Pouched. The Mother Animal, Wholly Unconscious of the Camera, is Observed to be Holding a Bouquet of Flowers She has Just Plucked

BIG TANKS MADE IN SECTIONS ON "KNOCKDOWN" PRINCIPLE

Big steel tanks for liquids may now be constructed on the "knockdown" principle by following the design of a Kansas inventor. The cylindrical side walls are built up of a number of curved plates, flanged toward the outside on all four edges, and forming a circle when assembled. An equal number of sectors, flanged at the sides only, form the top of the tank, and a small circular plate is provided for closing the center. The bottom is similar, except that the inner ends of the sectors are flanged, and the opening closed with a flanged disk. All flanges are outside, waterproof gaskets between them, and bolted through steel reinforcing strips.



GAUZE IMBEDDED IN LEAD AS REINFORCEMENT

Reinforcing lead with iron or steel gauze gives the soft metal rigidity and strength, according to the inventors of a method for accomplishing this result, and overcomes many of the difficulties otherwise encountered when it is used in sheets or pipes. The gauze is prepared by coating it with lead or lead-antimony, and then imbedded in a sheet of lead somewhat thicker than desired. Rolling the sheet while cold reduces it to the proper thickness. A pipe, 8 in. in diameter, made of ¼-in. reinforced lead, withstood a pressure eight times greater than one which burst a pipe of the same diameter, but made of ⅞-in. lead without reinforcement.

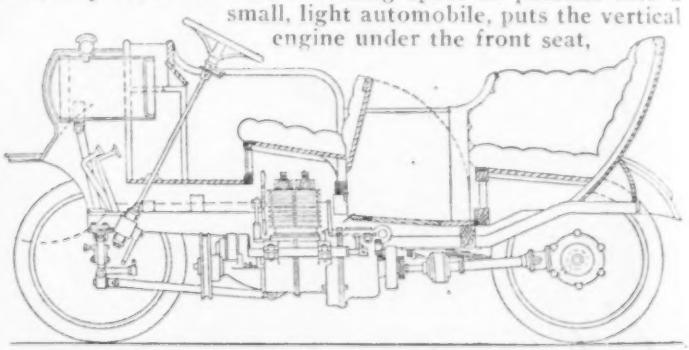
¶ The town of Guthrie Center, Iowa, with a population of less than 2,000, is the first town in Iowa to own an airplane. The town officials have purchased one from the Canadian government, and will use it to advertise the community and in campaigns boosting the town and adjacent territory.

INDUSTRIAL-FELLOWSHIP IDEA GROWS IN IMPORTANCE

Readers of Popular Mechanics Magazine as far back as April, 1914, may recall the story of the Mellon Institute of Industrial Research of the University of Pittsburgh. At that time laboratory work was being pursued under 21 industrial fellowships, the term signifying endowments made by industrial concerns for the scientific solution of specific problems. Report for the year ended March 1, 1919, indicates a marked increase in this progressive activity, there being now 47 fellowships, with five more awaiting laboratory space, and 77 fellows working. Endowments for the period totaled $238,245. The institute itself, most complete of industrial experiment stations, represents an investment of about $350,000. Five years ago it was housed in a crude frame building.

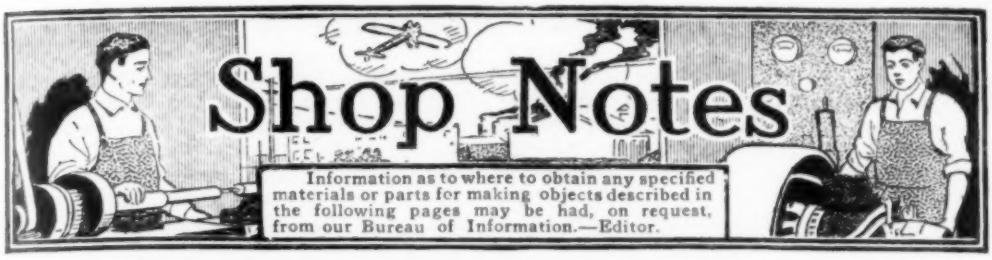
AUTO DESIGNED IN JAPAN HAS MOTOR UNDER SEAT

A Japanese inventor, determined to get as much seating space as possible into a small, light automobile, puts the vertical engine under the front seat,



By Placing the Air-Cooled Engine under the Front Seat, This Automobile, of Japanese Design, Secures a Large Seating Space in a Light Car. The Seat is Hinged and Tilts Back for Inspection of the Motor

which tips over backward for inspection. A fan, in a ventilation chamber surrounding the motor, air-cools it. The gasoline tank is in front, in place of the absent radiator. While the architect of this vehicle evidently achieved his object, the result is somewhat reminiscent of our own achievements of 1900, or thereabouts.

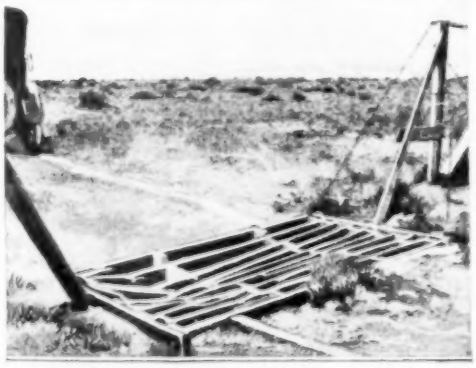

Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

Animal-Proof Automobile Gates

By THOMAS A. LEADLEY

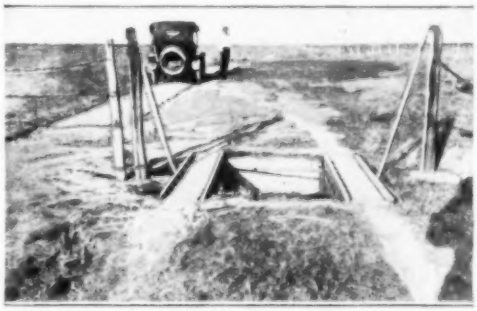
ON the ranches of western states, where fences are now quite numerous, it becomes very important to have some kind of gate through which an automobile can pass without loss of time, but which will prevent the passage of cattle. The photographs show two types of gate which have made their appearance in response to this demand. The usefulness of such a gate is, of course, not confined to the large ranch. The idea may prove to be a timesaver on many smaller stock and dairy farms.

The gate shown in the first photograph is perhaps the easiest to make, and the least expensive, though not very durable unless made of heavy lumber. This gate consists of a shallow pit extending across the road, over which is placed a wooden frame, with several crosspieces of 1 by 6-in. lumber at right angles to the road. The outer frame is supported by stakes driven into the ground, and each crosspiece is supported in a similar manner. One stake is driven in each corner of the frame, and two between the corners, these supporting directly both the outside



This Simpler Type of Gate Is Merely a Framework of Planks Set on Edge, So as to Give No Footing for Cattle

frame and the crosspieces. The latter are placed 4 or 5 in. apart. A slanting post, or wire, extends from each side of the gate to the top of the adjoining fence, and thus prevents the animals from getting through without going over the pit.



A Gate Consisting of a Pit with Two Narrow Bridges over It, to Fit the Tread of the Car, Permits More Comfort for the Motorist

The principle of this gate is the same as that of the cattle guard at a railroad crossing. Animals are naturally shy of holes or pits, and the crosspieces with their intervening space do not offer an inviting path for the animals to venture on. The automobile can be driven over safely, though this type of gate is a little rough for the occupants of the car. The gate shown in the illustration had broken down at one end because of a heavy load, and hence the need for heavier material in building it; probably 2 by 6-in. timbers would not have broken. The pit beneath this gate was shallow enough so that the broken end did not impede traffic. A more permanent construction for this gate would be to make a concrete foundation around the pit, and on it, parallel with the road, to place two heavy crossarms or joists to support the crosspieces.

The other gate, which is more satisfactory to the motorist, because of its smoothness, and should be just as satisfactory in preventing cattle from going through, is shown in the second photograph. This type is also more permanent. The pit for such a gate should be at least 2 ft. deep. This one has a concrete wall

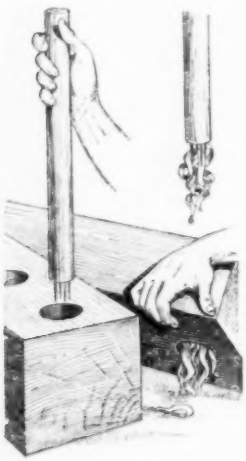
built around it. On each side is a treadway or trough, about 1 ft. wide, with protectors on the side, and covered with boards. These treadways are the proper distance apart for a standard-gauge vehicle to pass over. The width of the gate the other way is 3 or 4 ft., or wide enough to prevent an animal from jumping the pit.

Careful driving is necessary to pass such a gate, but it is perfectly smooth. The pit is in plainer view to the animal in this type of gate than in the one previously described, and the treadways on which the car passes are so narrow and so close to the side posts that the animals would have to be extremely surefooted to cross this gate without being brushed off into the pit.

Of course, neither of these gates can be crossed by horse-drawn vehicles, and therefore an old-style gate is placed at the side of every automobile gate.

Removing Shavings from Deep Auger Holes

Bridge builders, and other workmen who find it necessary to bore rather large and deep holes in timbers, will find the tool illustrated very useful in removing shavings from the holes. It is merely a straight round stick slightly smaller than the hole, with four or five six-penny nails driven into one end of it so as to leave about 1¼ in. protruding. The heads are cut off and the ends filed to a point.



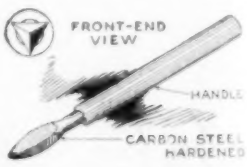
The tool can be used in two different ways. If the timber is loose, and light enough to be readily turned over so as to let the shavings fall out, the tool will be of use in breaking up these chips or shavings so that they will readily fall. To do this, thrust the tool into the hole and revolve it a few times, while pressing it against the chips in the bottom. This will break and tear them so that they will more readily fall out when the timber is turned to the proper position. If the hole cannot be turned so that the chips will fall out, they can be largely removed by thrusting the tool straight into the hole, so as to catch the shavings on the prongs, and carefully withdrawing it.—J. C. Bailey, Peru, Ind.

A Simple Rack for Draftsmen

At different times a draftsman needs a large number of tracings and blueprints for reference, when working on a single job, and unless he has them arranged in a systematic way, he loses a good deal of time in picking out each sheet as needed. In addition, he has little room to work if his table is covered with a pile of drawings, and his difficulties are seriously increased if he is engaged on the kind of map work in which one job is continued from sheet to sheet. A handy rack which takes up little room can be made out of a 2-in. plank, about 1 ft. square. Plane and sandpaper it, and drill sixteen 1-in. holes—four to a row—which should be enough for most purposes. Sandpaper the inside of the holes, varnish or stain the block as desired, and mark numbers neatly against the holes. The rolled drawings can then be placed in the holes, so that they will take up little room, and will be easy to pick out. Drawings usually have numbers assigned to them for classification on the drafting-room records, but for this purpose it will cause no confusion if temporary numbers are given to the different sheets, corresponding to the holes on the board. The numbers can be written lightly in pencil on the backs of the sheets, and can be erased afterward.

Three-Edge Ink Eraser

An ink eraser that possesses several advantages for the draftsman is a small three-sided scraper. It is made from a piece of drill rod, and hardened. The faces are then ground, and the edges finished on an oilstone.



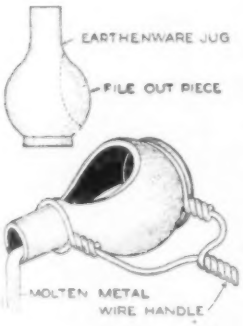
It possesses the advantage of being able to remove ink quicker than a rubber or sand eraser with a shield, and it also permits removing a smaller portion of a line without touching the surrounding lines. It will be found as sharp and efficient as a penknife, but will not dig in and cut the paper or destroy the fibers, as a knife will.—S. B. Royal, Baltimore, Md.

Poultry-House Walls Reinforced with Straw for Winter

A good way of giving poultry additional protection against cold during the winter months is to reinforce the wall of the poultry house with straw, on the side most exposed to the wind. Drive two or three posts into the ground about 16 in. from the wall, and stretch wires between the posts, spacing them about 4 in. apart. Start the job at the bottom, and when three or four wires have been put up, tamp straw in tightly between the posts and the wall, until the straw reaches the uppermost wire. Then add more wire until the desired height is reached, and tamp in straw up to the top. In the spring, the wire can be removed and the straw taken out, the posts being left ready for the next winter.—W. A. Goodman, Glencoe, Okla.

Earthenware Vase as Melting Ladle

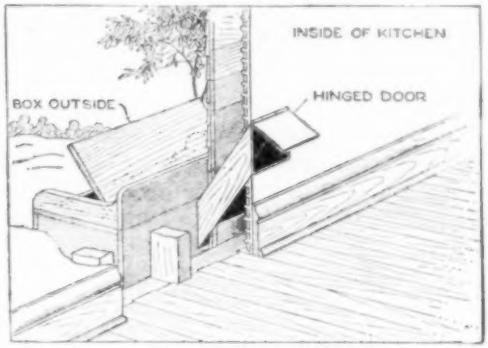
Requiring a small melting ladle with a spout, and having none at hand, a mechanic made one out of a small earthenware jug. He cut away part of the side with a file, to make an opening for filling, and improvised a handle out of a stout piece of wire, bending it double, and forming loops or rings at one end, to hold the neck and base of the jug. A piece of garden hose was slipped over the end, to protect his hands from the heat caused by melting the metal over an open flame.—Harold E. Benson, Boulder, Colo.



Junk Receptacle Handy to Kitchen

The housewife takes so many steps in preparing meals that any device which saves her a few trips is very welcome. Carrying tin cans, broken glass, or other "junk" to the usual box or barrel at the back of the lot is a disagreeable task. The receptacle shown in the drawing will save all such trips, it being necessary to empty the large box by wagon only once in several months.

A trough, about 4 by 8 in., is set in the kitchen wall at such an angle that nothing will be likely to catch in it and clog it. The upper opening is closed by a small door, hinged at the top, which should have a knob, for convenience in operating.

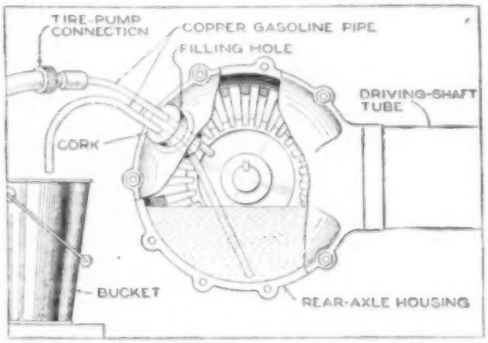


A Device Especially Appreciated in Winter Is a Chute for the Disposal of Tin Cans and Glass

The lower end of the trough opens into a large box, with a hinged lid, placed against the outside of the kitchen wall. If this box is carefully made, and is painted, it will not detract from the appearance of the place. It can readily be made into a comfortable bench, and no one will suspect its humbler use. But the main thing is that the device saves many steps.—J. Horace Van Nice, Waukon, Ia.

Removing Grease from Rear Axles

The necessity of removing and replenishing the grease in the rear axles of cars, where no drain is provided, caused a garage mechanic to devise and construct the following simple arrangement,



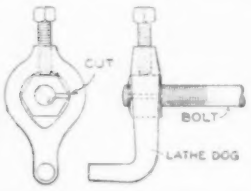
A Cork, Fitted with Two Tubes and a Tire Valve, Provides a Ready Means of Draining the Rear-Axle Housing

which facilitates removal and permits flushing out of the housing thoroughly with kerosene.

It consists of a cork and two pieces of copper gasoline pipe. The device is used with a tire pump; the end of a discarded tire valve is soldered to one pipe for connecting to the pump hose. The other pipe almost touches the bottom of the housing, so that the pressure will force practically all the grease up through it.—G. A. Luers, Washington, D. C.

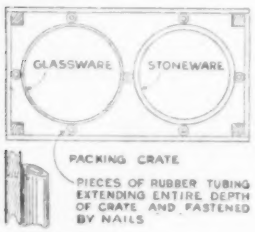
Gripping Threads with a Lathe Dog

When a round piece has to be gripped by a lathe dog, and it is not permissible to cut a flat on the end to give a footing for the dog, it is possible to get a good grip by using a spring bushing between the work and the dog. In the case of a threaded bolt, a good way is to slot an ordinary steel nut of the proper size, sawing through one of the angles of the hexagon. The nut thus forms a suitable bushing, having threads inside to grip the bolt thread, and flats outside to take the dog.—Joseph F. Convery, Worcester, Mass.



Old Rubber Hose for Packing Fragile Objects

When packing glass or earthenware jars of cylindrical shape in a wooden box for shipment, it is a good plan to use pieces of an old rubber hose as buffers. They can be nailed against the sides of the box, as shown, so that they assist the excelsior, or whatever packing is used, to prevent breakage. The piece of hose between the jars is held in position by the tightly packed excelsior; or, if a still safer packing is wanted, the piece can be slit through at two or three points, and thin strips of wood fastened across the box, so that they pass through the slits at right angles to the hose, and hold it securely. The latter method should be avoided, if possible, as the strips would make the tubing more rigid.—Roy H. Poston, St. Francois, Mo.

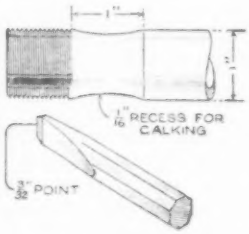


Warming-Closet for the Kitchen

Remembering the many times when food has to be kept warm for belated guests, a housewife had the closet beneath the cupboard in her kitchen equipped with shelves which consisted of radiators through which passed hot water from the house-heating system. The radiators were suspended on hooks provided for the purpose, and the closet was built so that it would close tightly. The result was a very effective substitute for a range provided with a warming-closet.—Dale R. Van Horn, Lincoln, Neb.

Steam Pipe Calked into Cylinder

A steam cylinder in a sawmill had a 1-in. steam inlet, the threads of which had become partially stripped, so that steam persisted in leaking out around the nipple, even when the latter was a newly threaded one, treated with white lead or graphite.

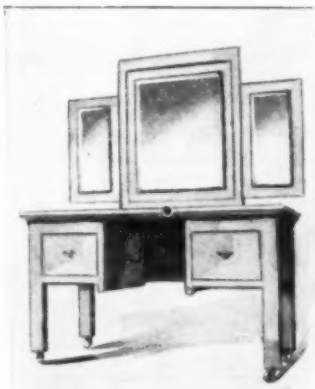


There was not enough metal to drill and tap the hole to take a 1¼-in. pipe, so the following plan was tried: A nipple was made with a thread somewhat larger in diameter than the standard; just at the end of the thread the nipple was ground concave for a distance of 1 in., and to a depth of 1/16 in. A 1-in. pipe tap was screwed into the hole in the steam chest, until it touched bottom. Then the nipple with its fittings was screwed in until the concave part entered well into the hole in the steam chest. This left a crack all around the nipple, which was calked with two turns of No. 18 gauge soft-copper wire. The wire was driven in with a special calking tool made by grinding a 3/8-in. flat cold chisel to the shape shown in the cut. The result was a permanent steam-tight joint.—R. C. Bradbury, Elizabeth, La.

¶A telegraph clerk who received many messages by telephone, used a head set with a watchcase receiver to act as auxiliary to the regular receiver, which he also connected to the head set. In this way he had a receiver at each ear, and practically eliminated the danger of misunderstanding a message.

How An OLD-FASHIONED DRESSER Was Modernized

By Mrs. Ruth Darling Shultis



THE dresser with the long single mirror, shown above at the left, belongs to a type which is not entirely up-to-date, and the owner wished to replace it with a more modern piece of furniture. To avoid the expense of purchasing a new one, he took the old one apart, and, without using any new lumber, made a dressing table of modern design equipped with three mirrors, as shown in the photo to the right. Nothing was purchased except brass angles and screws to hold the side mirrors, brass handles of modern pattern, and enough paint for three coats, the total expense amounting to less than a dollar. It was necessary, of course, to use caution in separating the parts of the old dresser, which had been dovetailed and glued together; but by unsealing the joints carefully it was accomplished without breakage.

The line drawings in Figs. 1 and 2 indicate the manner in which the material was rearranged to form the new dresser. The old one was not completely dismantled, as some of the framework was needed in the new one without any change in construction; but the mirror was altered beyond recognition. In the drawings, each letter indicates a part of the old table, which was used in a new position on the new one. Fig. 1 shows the locations in the old piece of furniture and Fig. 2 those in the new one, with the exception of pieces B and F, which are not visible in Fig. 2, but are used in positions corresponding respectively to A and E. The frame of the central mirror was secured on the new dresser by means of wooden strips screwed to the back. The old mirror had swung on trunnions in an outer frame, and it was similarly attached on the new table, after the uprights had been shortened and the carved decoration had been removed from the top. The same trunnions supported the altered center mirror, and the small mirrors were fastened to each side of the central frame by brass angles screwed to the top and bottom.

To brighten the appearance of the dresser, a coat of flat white was applied, followed by two coats of white enamel, each coat being allowed 24 hours to dry. This enameling was necessary to the complete transformation of the dresser, as the modernity of the new design was out of harmony with the somber tones of the obsolete model. The table top was slightly below the level usually found on modern dressers, but familiarity with the old dimensions made the owner averse to a change.

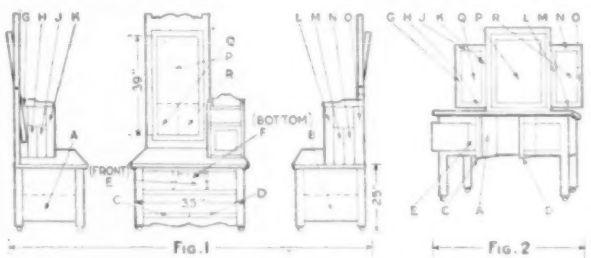


Fig. 1 — Fig. 2

To the Left is Shown the Dresser before Alteration; to the Right Is the Finished Dressing Table. The Letters Indicate the Old and New Positions of the Various Pieces

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¶Tin cans as hub caps are not a very decorative addition to wagon or buggy wheels, but they have been used on very muddy roads to keep dirt out of the bearings. The can is placed over the hub, and held in position by wood screws driven into the hub through holes punched in the sides of the can.

Flagpole Protected by Creosote

At one of the U. S. submarine bases on the Pacific coast there is a tall wooden flagstaff which was threatened by the decaying of the wood near the base. An

This Naval Flagpole was Saved from Decay and Boring Worms by a Creosote Treatment Applied through a Pipe

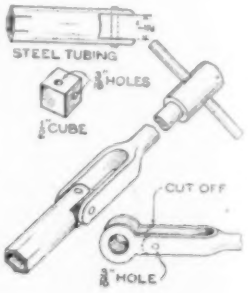
attempt was made to preserve it by building a large concrete cone extending several feet underground, but this did not seem to put an end to the rotting of the wood. Members of the sub-base repair crew examined the pole, and learned that the trouble was partly due to the ravages of the damp sea air and partly to the gradual consumption of the wood by a species of minute wood-boring worms. A hole was therefore bored into the pole obliquely, and almost through it, from one side to the other. A 2-in. iron pipe was then driven into the hole, after being drilled with small perforations over its entire surface. Creosote was poured into the pipe, and a screw plug fitted in the end, as shown in the photograph, so that the preserving chemical was distributed through the entire center of the pole, gradually working its way down through the grain of the wood. After the pipe had been filled with creosote five times, no signs of further decay were observed. The pipe has been left in the pole for a repetition of the treatment, should it be found necessary; but the pole is not likely to decay further, now that it is thoroughly saturated with creosote, and the chemical seems to have completely exterminated the worms.—John E. Hogg, Los Angeles, Calif.

Rawhide Shaft Coupling

A machinist found it necessary to couple a motor shaft with a pump shaft, so that the drive would be direct. The coupling at the end of each shaft was provided with a disk, or flange, with bolt holes drilled through it, so that it could be bolted to a corresponding flange on another coupling. In this case, however, the flanges did not match, one of them having six bolt holes and the other four; and the circles forming the center lines of the two rings of holes were not of the same diameter, so that none of the holes on one flange came opposite a hole on the other. In addition, the two flanges could not be brought within half an inch of each other. The problem was solved by filling up the gap between them with a rubber disk, or gland, taken from an old pump, and tying the couplings together with rawhide belt lacing. The lacing was passed in and out of the bolt holes, and outside the circumference of the rubber gland; and by using a large quantity of lacing, and fastening it securely, an excellent connection was made, which did duty for several months without giving any trouble.—G. L. MacLean, Robertsonville, P. Q., Can.

Universal-Joint Socket Wrench

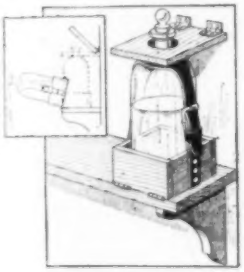
Many an awkward job is made easy by using a socket wrench provided with a universal joint. To make a wrench of a given size, heat a short piece of steel tubing, and drive a nut of that size into one end of it, swaging the tube to the right shape. Cut the other end, as shown, and drill holes through both jaws. Then cut the eyes off an automobile brake-rod clevis, and, after rounding off the edge, drill the remaining part of the fork; in this way the tube and clevis will form corresponding yokes of the universal joint. To connect them, use a square block of iron which will make a fairly loose fit in both



forks, and drill two holes through it, as shown; these holes must be at right angles to each other, and must both be off center, to prevent them from intersecting. Then pin all three parts together, and the working end of the wrench is complete. There are various ways of making a handle, but a fairly good one is formed by flattening the end of the clevis arm, fitting a collar over this end, and making it tight by flattening with a hammer. A short piece of rod is then passed through a hole drilled in the collar.—W. C. Reichard, Syracuse, N. Y.

Hinged Rack for Bottles

In laboratories, photographic studios, drug stores, and other places where large bottles are constantly used, the labor of taking them down from shelves and returning them is a fatiguing part of the day's work. If, on the other hand, they are kept on the floor under a bench, a good deal of effort is required to lift them, and they are likely to be broken by an accidental kick. To remedy the trouble, make a wooden box just large enough to hold each bottle, and fasten it to the shelf by hinges. Place the bottle inside it, and secure it by means of a leather strap, which fits over the shoulders of the bottle and is fastened to the box by screws. A wooden safety collar is hinged to the wall, and is dropped over the neck of the bottle to prevent it from falling forward by accident. When the bottle is to be used, the safety collar is raised, so that it can be tilted forward, as shown in the small detail drawing.—Albert E. Jones, East Milton, Mass.

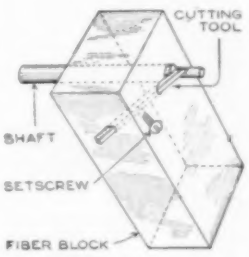


Saving the High-Speed Steel

The expense of using tool steel can be greatly reduced if each tool is used until all the material is worn away. This is made possible by using cheaper material with it. When the tool gets too short for further use, weld it to a piece of bar stock of the same diameter. A tool can be welded to both ends of the bar, which can be used for the same purpose many times.—Jack Solon, Natchez, Miss.

Metal Turning without a Lathe

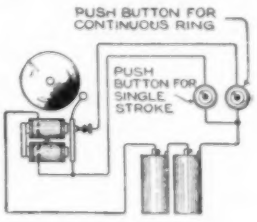
The sketch shows a handy method of turning a shaft without using a lathe. The shaft is passed through a block of fiber, which is sufficiently regular in shape to be held securely in a vise. Drill a hole through the block, large enough to admit the shaft without allowing side play when it is revolving. Drill another hole in the side of the block, as shown, to admit the cutting tool, and when it has been adjusted for operating, hold it firmly in position with a setscrew. To revolve the shaft, hold it in the chuck of a breast or hand drill, and turn it against the tool. The latter should be so adjusted that it will bring the shaft down to the right diameter at the first cut.



This method has given very good results on brass rods. It is not absolutely necessary for the block to be of fiber, but the material should be hard enough to prevent enlargement of the hole which is used as a bearing for the shaft.—Philip G. Bernholz, East Orange, N. J.

Bell Rings Either Continuously or by Single Strokes

It is often convenient, when installing a large electric bell in a shop, to connect it so that it will ring either continuously or by single strokes. For instance, a certain number of strokes may be a call for a certain employe, while a continuous ring may be a danger alarm, or a signal to quit work. The bell is connected as shown in the diagram. When the single-stroke button is pressed, the circuit is completed through the electromagnets, and current flows continuously until the button is released, thus holding the armature down and not permitting it to vibrate. When the other button is pressed, the circuit is broken with the usual vibrating motion, ringing continuously as long as the button is held down.

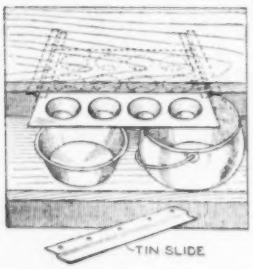


Linoleum Riveted to Auto Mat

The rubber mat of a car becomes worn under the driver's heels before the rest of the mat shows any wear, and gives the mat an untidy appearance. The life and good appearance of the mat may be materially lengthened by riveting a piece of heavy linoleum in the space under the driver's heels, as shown in the photograph. A smooth, neat job may be done if bifurcated rivets are used, which will leave no projections to rub on the floor boards.—Harvey Mead, Scranton, Pennsylvania.

A Rack for Cooking Utensils

Sometimes the housekeeper with a limited amount of kitchen space is at a loss how to dispose of her cooking utensils. This particular method of stowing away gem pans, and other flat tins, will then prove valuable. Secure several narrow strips of tin, as long as the width of the shelves in the pantry, and bend them as shown. Nail these to the undersides of the shelves, just far enough apart to form slides to accommodate the different-sized pans. Thus all flat tinware can be easily and conveniently placed out of sight, and yet can be quickly reached when needed.—L. B. Robbins, Harwich, Massachusetts.

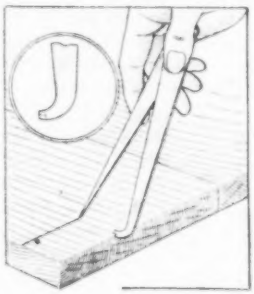


Squash Keep Better When Coated with Shellac

Many people have trouble keeping winter squash without spoiling. By preparing them properly, they may be kept as late as June or even July. Pieces of barrel stave, or other board, should be placed under each growing squash, so that it is not in contact with the ground. This insures the shell being in uniformly good condition. When frosts threaten in September, pick the squashes and place them on a platform in the sun, where they will become hard and dry. They must be covered at night to protect them from frost. When hard, they should be given a coat of shellac. Others may be kept for some time by placing them on a shelf in the cellar near the furnace, where they will become dry within a fortnight. If they are then removed to a moderate temperature, they will keep for some weeks without shellacking, but those to be kept long after Christmas must be given a heavy coating, or they will not keep.—J. T. Bartlett, Ft. Collins, Colo.

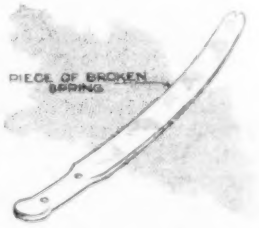
Shoulder on Hermaphrodite Calipers

To insure accurate work, a mechanic filed a square notch in the curved leg of his homemade hermaphrodite calipers, so that it could not slip. The leg was made unusually broad, for this purpose.



Tool Made from Auto Spring

A tool of the kind shown in the sketch can be made from the broken spring of an auto or buggy. Cut a 16-in. piece from the end of one of the leaves, and make a small sharp-cornered notch at the thin end. Then form a handle at the thick end by grinding or forging, and the tool is made. Its usefulness lies in the ease with which it can be inserted into the narrowest space, to obtain a leverage for removing box lids, boarding, paneling, and even metal plates; and it is therefore valuable to the machinist as well as the carpenter. It is particularly handy in loosening wainscoting and finished woodwork in places where it would be dangerous to use a chisel or crowbar; and by means of the notch at the end, nails can be pried loose in awkward corners where no other tool can be handled.—Henry Simon, Laguna Beach, Calif.



Emergency Light for Tire Work

It is not uncommon for a motorist to be stalled at night with tire trouble, and to find himself without a trouble lamp. When in such a situation, scrape together a small pile of sand, pour ¼ pt. of gasoline upon it (about a cupful), and touch a match to it. It will burn for 15 or 20 minutes, and will provide sufficient light for an ordinary tire-repair job. It is even practical to carry a small can of sand under the seat or in the tool box, if the car is not equipped with a trouble lamp. Caution is necessary, of course, in using this expedient. Keep a reasonable distance between the burning gasoline and the car—especially that part of it where the gasoline tank is mounted.—John Madlena, Standard, Ill.

Grass Mat for Working on Ground

For doing work on the ground, such as in the garden, it is well to have a mat to put under the knees when the ground is wet. Mats made of cloth, or even carpet, will get wet in time, as the moisture is absorbed from the ground. A type of mat which is proof against this is made from long grass. To make it, lay out four or five bunches of grass, about 3 in. in diameter. Tie around the first bunch several pieces of long binding twine, placed about 1 ft. apart; then add the second bundle, like the first, and tie the twine also around it. After as many bunches as desired are tied together, run twine around the whole mat, sufficient to hold it together. Such a mat is good for a whole season's service. I have used one

A Mat Made from Bunches of Long Grass, Tied Together with Twine, does Not Absorb Moisture

many a day in nursery work, principally when budding trees. To make the mat I used slough grass, about 8 ft. high.—F. E. Dougan, Pawnee, Okla.

¶When tracing a blueprint, provide a duplicate of it for reference, if possible.

Mail Boxes on Buggy Wheel

Farmers in several different parts of the country have discovered a way in which they can make use of an old buggy

An Old Buggy Wheel and Axle, Set Up in This Way, Provide a Great Convenience to the Rural-Mail Carrier

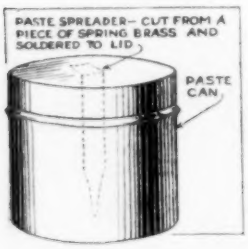
wheel, and at the same time furnish a great convenience to the rural-mail carrier. Several mail boxes are mounted on the wheel, which is set up at a convenient spot on its axle. The axle may be set in a concrete base, or merely driven into the ground. The mail carrier, rotating the buggy wheel, can bring each box in turn into the most convenient position for inserting the mail.

Producing Small Hyacinth Bulbs

Experiments by nursery gardeners have developed a method of making one hyacinth bulb produce several. When the bulb is fully ripe, divide it with a knife in such a way that the part which contains the shoot will be conical in form, and the other part will show a cavity corresponding to the shape of the cone which has been cut away. The hollowed portion must be covered with soil containing very little moisture, and in about a week a large number of small bulbs will appear. Pull these away and place them in soil, where they will grow to full size and eventually produce flowers.

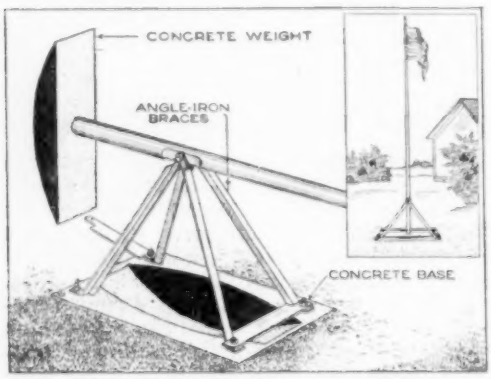
Dipper for Soldering Paste

The small tin cans which contain soldering flux in paste form are very convenient to carry, but whenever the paste is to be applied to a joint it is necessary to use a sliver of wood, or something similar, to spread it. This is usually thrown away after it has been used once or twice, and as a quantity of paste generally clings to it, the result is considerable waste. Time is also lost in hunting for a new sliver whenever paste is to be applied, and if a chip of wood is kept in the can, it gets completely covered by the paste, which makes it very awkward to handle. It is a good plan, therefore, to solder a strip of thin brass, or other metal, to the lid of the can, as shown in the sketch. The lid then serves as a handle, the fingers are kept clean, and no paste is wasted.—J. A. Weaver, Baltimore, Md.



Flagpole Easily Lowered for Repairing

After a flagpole is once set, it is often sadly neglected on account of difficulty in taking it down or getting an expert to climb it, which involves quite an expense. To make it easy to paint or repair a flagstaff of either wood or steel, a mounting is suggested which allows the pole to be easily lowered to the ground,



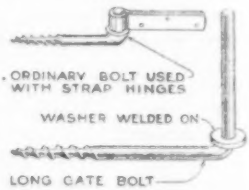
When Repairs Are Necessary to the Flagpole, It Swings on a Pivot to a Horizontal Position

and raised again by means of a concrete counterbalance at the base. The pole is mounted, at a suitable height, on brackets formed of angle iron, as indicated in the drawing, and set on a concrete base. The counterweight should be nearly sufficient to balance the weight of the upper part of the pole, and may be held securely in position, when the pole is raised, by iron bars set across the bolts which fasten the frame to the concrete base.

To avoid damage by frost, the pit in the cement should be shaped so that the two sides are slanting and not parallel to each other, as indicated. In case of water collecting, between the counterweight and the base, and freezing, the expansion will merely raise the pole and counterweight a short distance. To permit this, the hole through the flagstaff, for the bolt on which it turns, should be slightly elongated vertically, so that the pole can slide up and down on it for perhaps ½ in., but cannot work back and forth in a horizontal direction when a high wind is blowing.

Long Hinge Bolt Holds Gate Securely

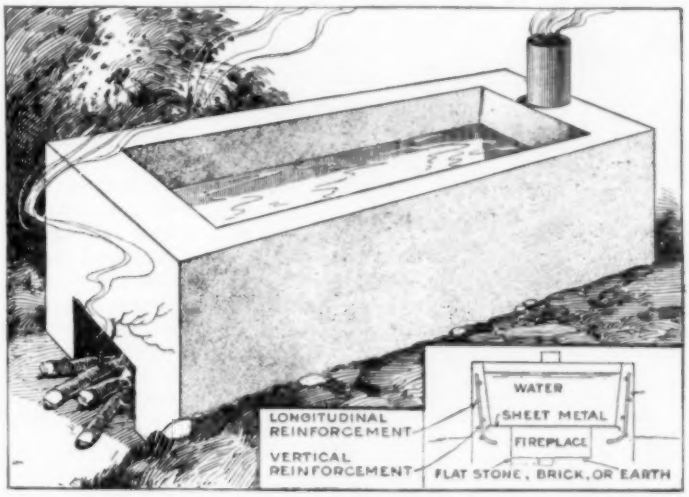
Among the troubles of a middle-western farmer was a gate which came off its hinges whenever it was raised a short distance above its usual position by a heavy snowfall, or any other cause. It swung on a strap hinge, and the vertical arm of the bolt which held the strap was so short that even a slight jerk was sufficient to lift it off the bolt. To make it more secure, a long bolt was made by heating a rod of the required diameter, and bending it to the necessary shape, after which a washer was welded on, as shown in the sketch, to make a bearing for the strap.



Heated Watering Trough for Cattle

As all dairymen know, their stock should not be obliged to drink ice-cold water. Comparatively few provide their animals with individual bowls, and so they must be allowed to drink at a trough. Ice will usually form on such a trough almost anywhere through the northern part of the country during winter, unless some means are employed to prevent it. Stoves have been built water-tight and submerged, but they are liable to give trouble.

A concrete trough having a heavy sheet-metal bottom, under which an open space is left for a fire, solves the problem very satisfactorily. The manner of constructing such a trough is shown in the drawing. In building it, after the foundation has been prepared in the usual way, the outer form and the inner one for the fireplace are set up, and the space is filled with concrete up to the level of the bottom of the trough. The metal bottom, which should have been previously prepared, is then laid in place, and the inner form for the trough set on top of it. Then proceed to fill the forms with concrete. The whole should, of course, be well reinforced, particularly at the corners.



A Trough Properly Built for the Purpose, Chiefly of Concrete, Greatly Simplifies the Problem of Warming the Drinking Water for the Stock in Wintry Weather

The metal bottom should be made of heavy galvanized iron, riveted and soldered if of more than one piece, with the edges bent over to insure a better grip in the concrete. If a very wide place is left for a fire, there should be metal supports laid in the concrete, for the metal bottom to rest upon.

One end of the fireplace should of course have an opening large enough for firing, and the other end of the structure should be made sufficiently thick to allow the building in of a length of galvanized pipe, made of suitable size at the top to take ordinary stovepipe, if the latter is required to provide draft. Pains should also be taken to reinforce the concrete around the pipe very carefully. A little fire built under such a trough on cold days will quickly warm the water sufficiently, and this heat may be retained for some time if a wooden cover is used to put over the trough while the stock is stabled.

Any waste material, such as old, broken boards, small dead limbs gathered from the woods, etc., may well be used to burn in the fireplace.—Arthur J. Dunckel, Dolgeville, N. Y.

Kinks for Bank Protection

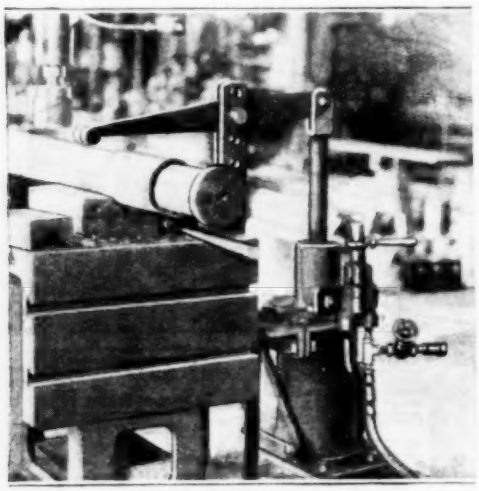
Newspaper accounts of the robberies of small banks indicate that the procedure of the burglars is in many cases the same. The watchman, or any person likely to resist the robbers, is imprisoned in the vault, or some secure place, and remains there until he is delivered by a chance visitor, or at the resumption of business on the following day. The same thing often happens in stores and residences, the victims in these cases being locked up in ice boxes, cellars, or cupboards, while the marauders loot the premises and make good their escape.

These cases are so common that it would seem practical to place a bell switch in the vault or cupboard in which the robber would be most likely to imprison his victim, so that, if not unconscious, the prisoner could sound an alarm which would arouse the neighborhood. Judgment would, of course, be used in selecting the location, and the existence of the switch should be revealed only to persons with whom the secret must necessarily be shared. As the hands of the prisoner are likely to be tied, the switch should not be more than three feet above the floor.

A mirror set at an angle at the rear of a teller's cage is a medium of protection already adopted in some country banks. It enables a teller to observe all the movements of a visitor, even with his back turned to the window, and, being set at an angle, is not conspicuous enough to warn a would-be thief.—Alva Dunlap, Des Moines, Ia.

Air Clamp on Drill Press

In the average railroad shop the ingenious mind has plenty of opportunity to exert itself. The photograph shows



The Air Tank and Brake Valve from a Street Car are Made into a Powerful Pneumatic Clamp for the Shop

how an air cylinder, removed from a braking system, is used in connection with an ordinary street-car motorman's valve to form a powerful clamp. The lever arm is bolted at one end to the upper end of the piston rod, and its center is pivoted so as to form an adjustable fulcrum. The other end holds the work firmly down on the V-block for machining. To release the clamp, the air valve is opened, and the clamp raised by a light touch with the hand.—Ralph O. McGraw, Chicago, Ill.

To Keep Films Pliable

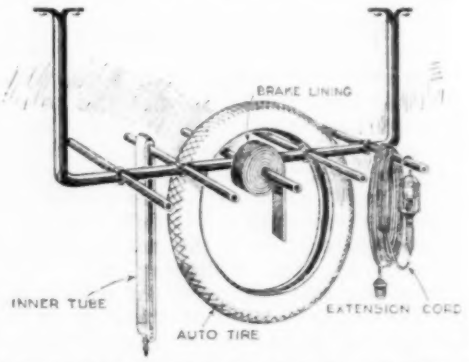
If moving-picture film is allowed to remain unused on the reel for a week or more, it tends to get hard and brittle, so that cracks are likely to occur in many places on its surface the next time it is run through the projecting machine, even if it does not get torn apart. An easy way to make the film soft and pliable is to run it through two rollers tightly pressed together, and for this purpose an ordinary typewriter can give good service. The film is fed into the typewriter between the rollers, and as it comes out it is rewound on an empty reel. Another way of softening the film is to keep a moist piece of rag or blotting paper fastened to the top of the case on the inside. —Philip A. Wall, Bedford, Mass.

Auto Exhaust Kills Ground Squirrels

Ground squirrels are one of the worst pests the farmers have to deal with. One way of exterminating them is by the use of exhaust gases from an automobile. This is done by connecting a length of hose to the exhaust pipe of the car and placing the free end down the squirrel hole. Earth should be packed around the hose to prevent the escape of the gas. The engine is then started, using as rich a mixture as possible. It is even advisable to use a fuel composed of half kerosene and half gasoline. The gas thus forced into the hole will be seen coming out of the other holes, sometimes at a great distance, but the squirrels are killed before they can escape.—W. L. Williamson, San Francisco, Calif.

Overhead Rack Made of Pipe

The type of rack here shown provides a handy place to hang spare tires and other automobile parts, and is very easily constructed out of lengths of pipe and a few bolts. The main hanger is made from a piece of 1-in. pipe, with flanges at each end to fasten it to a beam overhead. To form the flanges, saw each end of the pipe to a depth of about 4 in., bend the divided parts through a right angle, flatten them, and drill bolt holes through them. Then bend the hanger to form three sides of a rectangle, using the long side to support the crosspieces, which are short lengths of ¾-in. pipe. Cut slots in the main hanger to admit the crosspieces, and cut corresponding slots in the latter, so that they will fit snugly. Then



A Rack, Made of a Few Pieces of Pipe, Enables a Garage Keeper to Hang Tires and Spare Parts within Easy Reach

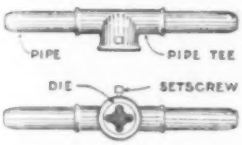
bolt the crosspieces in position, and fasten the hanger overhead with screws or bolts of suitable size.

Homemade Picture Puzzles

Most children are familiar with the puzzle pictures which are composed of a number of disconnected parts. A child soon gets tired of the same picture, but an amateur photographer can renew the puzzles indefinitely with landscapes, preferably with human figures or animals in the foreground; and a good enlargement, if mounted on cardboard and cut up into small parts, will give a child a great deal of entertainment. A better job can be done if the enlargements are mounted on thin boards and cut up with a jig saw. Do not make the puzzle too difficult, as this will only perplex the child and diminish his enjoyment. The more prominent objects in the picture should be fairly easy for him to trace from one fragment to another. A good way of introducing him to the game is to start him on a large portrait of some relative, so that the familiar features may serve as a guide.—Abel Green, New York, N. Y.

Die Stock from Pipe Fittings

A pipe tee with the central portion bored out and enlarged, so as to hold a small die, has been found an excellent makeshift for cutting threads. A small hole is drilled and tapped at one side, to take a setscrew, and two short lengths of pipe are screwed in at each end, to serve as handles. The ends are rounded off with a file, or in the forge, giving the hands a smooth grip.

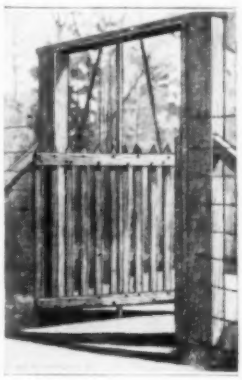


Holes Drilled in Auto Frame Identify Car

Automobile thieves make a practice of disguising stolen cars to prevent subsequent identification. Most distinguishing marks can be removed, but the owner's name or initials can be rendered inefaceable if the lettering is made with 1/16-in. holes, drilled through some part of the frame where the removal of this small amount of metal will not appreciably weaken it. A letter may be, say, 5/8-in. high, composed of lines of five or six holes each, and located the same distance from the top flange of the frame member as from the bottom. If the thief plugs the holes afterward, they can still be detected.

Self-Closing Nonsagging Gate

Among the most exasperating things that can happen is to have a gate that should be kept closed, continually left open by passers-by, or to have the fences torn down by people crawling through or over. Where such troubles are experienced, the gate pictured will eliminate the difficulty. A hole is bored in the center of each crosspiece so that the gate may be swung on an iron pipe held at the top and bottom. Chains, from the top crosspiece, support the gate at the proper distance from the ground. When pushed open they raise the gate slightly, and its own weight causes it to close rapidly. A strong cross support at the top will keep the fence tight and make bracing of the gateposts unnecessary. Its simplicity of construction and durability are apparent. —A. S. Romig, Boulder, Colo.



Wire Brace for Worn Broom

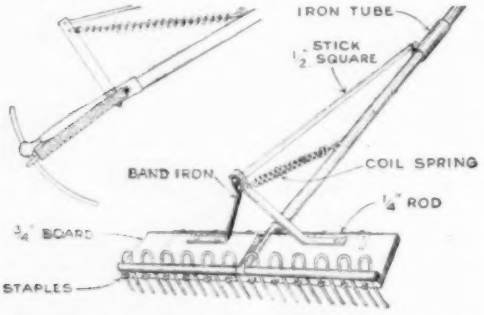
Most housewives know how ineffective a broom becomes when the bristles get curled up. A good method of preventing this is to stiffen the bristles with a brace made of a single piece of spring wire, bent as shown.

Steel Colored Blue without Heat

When it is desired to give a blue color to a gun barrel or other piece of steel, and to avoid using heat, clean the metal thoroughly, and cover it with a solution containing ten parts of water and one part of nitric acid. After a bluish shade has appeared, wash it with warm water, using a soft cloth, and wipe it dry. Then rub it well with linseed oil.

Attachment for Garden Rake Removes Leaves Instantly

Raking fallen leaves would take much less time if it were not frequently necessary to stop and clear the teeth of the rake. This can be facilitated if the head



The Teeth of a Garden Rake are Inclosed by Movable Metal Loops, Which Free Them from Encumbering Leaves

of the rake is equipped with a row of metal loops or staples, which fit around the teeth, as shown in the sketch. The staples are driven into two short, flat boards, which project on either side of the handle as far as the ends of the rake. These drop when impelled by a lever, and force out any leaves and other material clinging between the teeth of the rake.

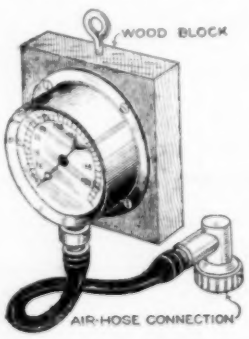
To furnish a rake with this device, drill a hole through the ferrule, from 2 to 4 in. behind the teeth, and large enough to make a loose fit around a piece of ¼-in. iron rod. The rod should be about 15 in. long, and half of it should extend on each side of the ferrule. Each end is bent to a right angle. Fasten one of the short boards to each half with staples; the ends of the rod are sunk into holes in the boards. Then drive large staples into the stick, in such a way that they will pass around alternate teeth, sufficient clearance being allowed to enable them to rise and fall freely when the iron rod rotates in the ferrule. Screw a piece of band iron to the sticks, bent to the shape shown, and fasten a light stick to it with a cotter pin; then attach the other end of the stick to a piece of metal tubing which fits loosely around the upper part of the rake handle, forming a sleeve. The function of the sleeve is to thrust the stick forward, and the band iron with it, so that the two sticks on either side of the ferrule will rotate, and depress the projecting staples far enough to free the teeth of the rake from leaves. A coil spring fastened to the piece of band iron will return the staples to their former position, as soon as the spring at the top of the handle is released. A short nail, driven into the handle below the sleeve, prevents the latter from falling too far down.

Lard-Pail Oat Sprouter

Poultry men who feed sprouted oats to their flocks have difficulty in keeping the feed in the proper condition without going to a great deal of expense. By using wooden lard or butter containers, which may be obtained at a grocery store, the trouble may be easily avoided. A hole is bored in the side of the pail near the bottom, and a wooden plug provided for it. In use, the oat sprouter is filled with oats, the hole is plugged and water poured over the grain. The pails must be kept in a dark, rather warm place, to encourage the sprouting. After the grain is thoroughly soaked, which usually requires several hours, the plug is removed from the hole in the pail and the water allowed to flow out. At least one pail should be kept empty all the time. This makes it possible to change the oats from pail to pail, in order to keep it from molding or otherwise spoiling. This system is both cheap and effective.

Tire Gauge Not Easily Lost

At an automobile service station on a highway leading out of a large eastern town, the manager was constantly losing his small tire-pressure gauges, which were appropriated by motorists who stopped to inflate tires. To make it difficult for a tourist to slip the gauge into his pocket after using it, the owner equipped his air compressor with a larger model, which was too bulky to be easily taken away. He chose a large-diameter pressure gauge, of the type used on boilers or air compressors, and screwed it to a flat block which was furnished with a screw eye, so that it could be hung from a hook on the compressor. The tire-valve connection was made by attaching a piece of rubber hose and coupling, of the type used for the filling hose.



Blanking and Forming with One Punch

By S. B. ROYAL

THE small sheet-metal clip shown in Fig. 1 is an example of a blanking and forming job which can be completed in one stroke of a simple punch and die —that is to say, one embodying neither tandem nor compound construction.

In the figure are shown, first, the general layout of the punch and die, and underneath it a view of the part to be produced. To the left are details of the punch proper and of the die, while below, the punch is shown at various times during the stroke which cuts and forms the part complete. It is necessary to use a strip of stock somewhat wider than the required part, to avoid distortion. As will be seen by examining the successive views in the lower part of the figure, the sharp edges at the bottom of the slanting face A start the cut by penetrating through the stock. The angle to which these faces are ground is such that the stock will round over, or curl, as indicated in the second view. In the third view the punch has moved far enough for the faces B to strike the stock. The curled portion is now completely formed, and at this point the faces B are forced through the stock. This has the effect of cutting the metal only at the edges toward the side of the die, as the edge where faces B and C meet each other does not come in contact with a cutting edge of the die, and therefore cannot cut the stock.

In the fourth view this cutting, by the faces B, of the two flat sides of the part which are opposite each other, has been completed, and these two sides are being squeezed between the faces C of the punch, to bring them just the correct distance apart and parallel to each other. In the remainder of the punch's travel, the face D of the punch severs the completed clip from the stock. The part will remain clamped between the faces C, and will probably have to be forced out during the upward movement of the punch by some device such as the knock-out punch shown in the layout.

The angle to which sides A should be ground depends on the thickness and material of the stock, as well as on the amount of curvature desired on the part, so that it is difficult to give any rules by which this angle can be determined. It will have to be found by experiment until the tool designer has had sufficient experience with this kind of punch. The safe method, of course, is to make these faces longer at first than would seem to be required, as they can then be ground down a little at a time until the correct angle is found to give the desired radius of curvature. The angle can then be

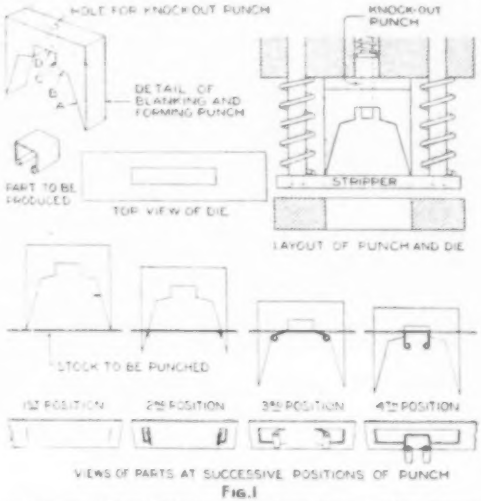


FIG. 1

A Layout, Two Details, and Four Progressive Views Illustrate the Operation of the Single-Stroke Blanking and Forming Punch and Die

measured and recorded for use in future design. The faces B can be made exactly horizontal when working in light sheet metal, of thickness up to about .040 in., and clips of this type are seldom made from thicker stock than this. When heavier stock is used, however, it is well to give a slight angle to the faces B, producing a "shearing cut." The angle must be very small, or the curling effect will be produced as with the faces A.

In Fig. 2 are shown a number of other clips, A, B, C, and D, which can be made with this type of tool. In the case of two of them, a suggestion is given as to the form of punch suitable for blanking and forming them in one stroke. In view of the high cost of punch-press tools, this process may be of interest to many shops and tool designers.

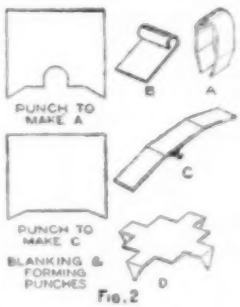
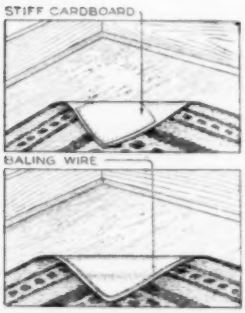


FIG. 2

¶ Many of the cheaper woodworking tools, such as chisels and plane irons, are so soft that nicks can be taken out with a file.

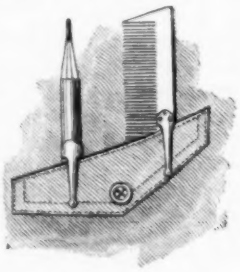
To Keep Carpet Corners Straight

Two ways are shown here of preventing carpets from curling upward at the corners. One is to sew a stiff square of cardboard under each corner, so that the edges of the carpet will run along the edges of the cardboard. Another method is to use a piece of stiff wire, such as baling wire; a 2-ft. piece is enough. Bend it at a right angle in the middle, and sew it to the lower surface of the carpet, just inside the edge. It will make the carpet lie flat, and if it gets bent upward by accident, it is easily bent back again. —Fred C. Davis, St. Joseph, Mo.



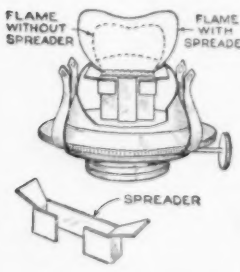
Pencil Clip Attached to Comb

To avoid the frequent loss of pocket combs, use an ordinary pencil clip with the ring portion cut off. It can be easily riveted to an aluminum comb, and will hold it securely in the pocket.



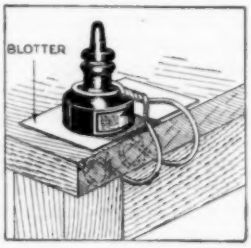
Flame Spreader for Kerosene Lamps

This simple device will materially improve the efficiency of an ordinary kerosene lamp, without appreciably increasing the consumption of oil. It is placed over the wick tube, and causes the flame to spread. The effect of the wings at the ends is to produce a slight vacuum just above them, which draws the flame outward, producing a larger flame area. The construction is easily understood from the sketch. It should be made of brass, about 1/32 in. thick, and should fit the wick tube snugly, but need not inclose it completely. The exact angle at which the wings are bent, and the distance of the spreader from the top of the tube, will depend upon the shape of the tube and burner, but the right adjustment can be made with a little experimenting.—C. A. Pease, Monrovia, Calif.



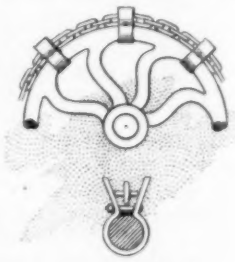
Spring-Wire Ink-Bottle Holder

Some of the devices used for holding an ink bottle steady are liable to scratch the finished surface of a table, but that shown in the sketch is free from this fault. Twist a single piece of wire, as shown, and bend it in such a way that, when the ink bottle is gripped as indicated, the two pointed ends will exert a slight pressure on the lower surface of the table top, so as to prevent the bottle from slipping.—Violet Johnson, Rockford, Ill.



Lugs Convert Old Brake Wheel into a Chain Wheel

When the chain wheel on a hand-operated crane, used in a foundry, broke, an old freight-car brake wheel was made use of to take its place. A number of lugs of heavy strap iron were bolted around the edge of the brake wheel in such a way that the chain could not slip off them. The wheel did good service until the proper repair part could be obtained.—M. E. Duggan, Kenosha, Wis.



How to Test a Used Car

Besides the general advisability of purchasing a used car from some person in whom the buyer has reason to place confidence, a few simple tests will be of assistance, although too much reliance upon them is not recommended.

No part of a car is more important than the steering gear. Certain small cars

have steering systems which are likely to make trouble if badly worn; this is difficult to detect on a smooth road, but will likely show up if the car is driven over a rough road at about six miles an hour. This kind of a test will also cause various rattles and squeaks, made by loose parts, to become noticeable. A bad clutch, or a worn transmission, can be manipulated by the demonstrator so that a passenger will not notice any trouble; it is therefore advisable for the purchaser to drive the car himself, and note the action of the clutch and gear shift. The brakes should be given good tests, both by stopping the car from a fairly high speed, and by braking down a hill.

Also, if possible, open the drain plugs of the transmission, and rear axles, and see if any oil or thinned grease runs out. Often a bad set of gears, or gears with broken teeth, can be made noiseless for a short run by packing the case with heavy grease.

One of the easiest things to ruin on some cars is the storage battery. See that it turns the engine briskly, and that the generator charges it at a proper rate when driving at a moderate speed.

During a driving demonstration, one should listen carefully for loud knocks in the engine and other parts. Worn bearings can be tightened to conceal somewhat the noise they would otherwise make, and certain loose parts can, by such methods, be made to run quiet for a time.

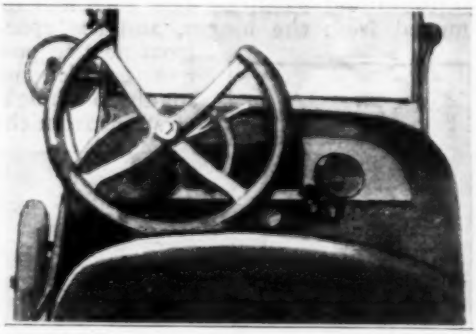
Above all, avoid an "oil pumper"; that is, an engine whose pistons and rings are worn so that it pumps oil into the combustion chambers, causing most of the misfiring and bad running generally. Such an engine will run smoothly for a while, but after a long drive, if misfiring has occurred, the valves should be examined for oil leakage, which is a strong indication that the pistons and rings are worn.

Some of these things a novice can do; for others he must take an experienced friend with him to the demonstration. But the most expert mechanic, unless he has actually seen and felt the entire mechanism of a car, cannot be sure that all parts of it are in good condition, and this fact makes it advisable to be very careful from whom the car is bought.—Adapted from National Harness Review.

¶A useful coat hanger can be made from a newspaper rolled up and suspended by a cord around its center.

Steering Wheel Partly Cut Away to Improve Driver's Vision

On many low-slung roadsters the top of the steering wheel is on a level with the driver's face, and often comes directly

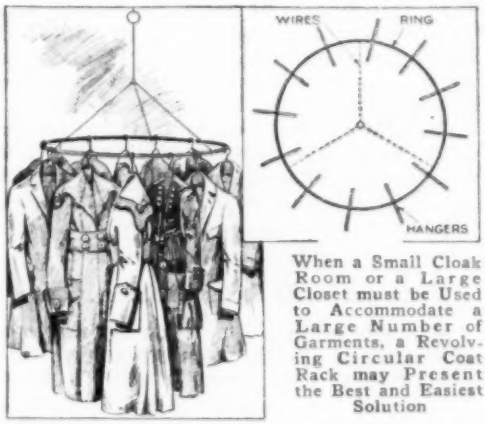


A Portion of the Rim of a Steering Wheel is Removed, to Give the Driver an Uninterrupted View Ahead

in his line of vision. To remedy this condition, a quarter of the wheel rim can be removed, thereby permitting an unobstructed view of the road; and, though the appearance of the wheel suffers a little, its strength is not impaired.

Rotating Clothes-Hanger Rack

In a household where parties were frequent, the coat room was generally found to be too small to hold the garments of all the guests. An auxiliary coat rack was therefore made out of a ring of heavy steel wire, and clothes were suspended from it by ordinary hangers. Anyone who used it could find his clothes by

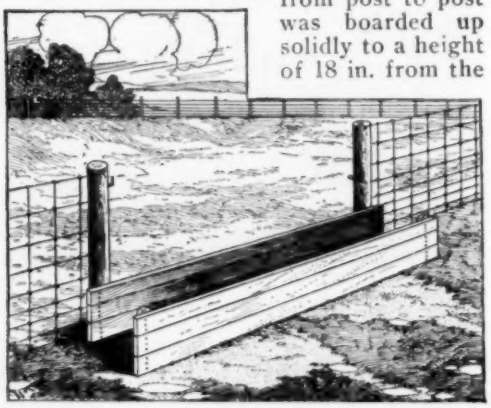


When a Small Cloak Room or a Large Closet must be Used to Accommodate a Large Number of Garments, a Revolving Circular Coat Rack may Present the Best and Easiest Solution

turning the ring, and as the pegs along the walls were used as well, the capacity of the room was doubled.

Hog-Proof Gate Allows Free Passage to Horses

A farmer uses this arrangement to keep the hogs in one lot, while allowing his cattle and horses to pass unrestrained into another pasture. The gate was removed from the hinges, and the space from post to post was boarded up solidly to a height of 18 in. from the ground. About 18 in. from each gate-post, inside the lot where the hogs were confined, a short post was driven. Long boards nailed from one to the other of these posts made another panel of board fence, 18 in. high and parallel with the boarded-up gate, with an 18-in. space between the two low walls. When a hog comes to this detached panel, it will go to the end and pass round into the narrow passage between the two board walls, continuing on through and out at the other end till it tires of the performance. One that is short enough to turn in the 18-in. passage is too small to jump or climb over the boards before it, and one that cannot turn is unable to face the wall and make the attempt to climb.



Two Low Fences across the Gateway will Stop the Hogs, but Allow Horses and Cattle to Pass

All other stock, except small calves or colts, will step over the low walls. No wide cracks, offering footholds, should be left between the boards.—H. F. Grinstead, Columbia, Mo.

Pads on Chair Legs Protect Floor

A simple method of preventing the legs of chairs, or tables, from scratching finished floors is to screw a small rubber disk at the bottom of each leg. To keep the head of the screw from touching the floor, make a depression in the wood with a brace and bit, at the spot where the screw is to enter. Then place the disk in position, and drive the screw as far as it will go. The center of the disk will be drawn a short distance into the counterbore by the screw head, but the outer part will form an effective pad.—James E. Noble, Portsmouth, Ontario.

Testing Metal Float for Leaks

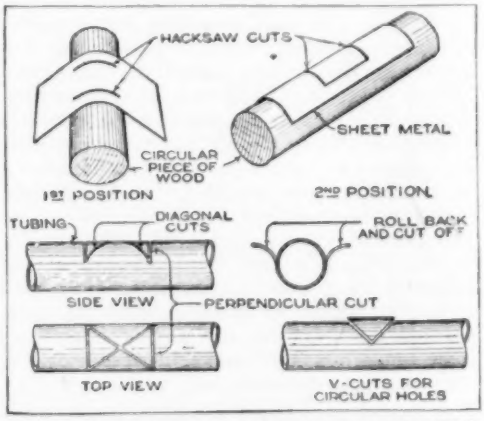
A leak in a metal float of a carburetor may not be visible to the eye, although indications of its presence are quite evident. To test the float, heat a vessel of water till it nearly boils, and immerse the float. The heated air inside it will expand, some of the air will be forced through any leak that may be present, and bubbles will form at this point, showing the position of the leak.—Howard D. Wildman, Schenectady, N. Y.

Spade Prevented from Cutting Shoe

Those who do a good deal of digging with a spade find eventually that the sharp upper edge of the blade causes considerable wear on the shoe which is used in pressing it into the soil. To prevent this, make a flat surface along the edge on which the foot is usually placed, by first making a vertical slit in the metal, near the handle, and then bending ½ in. of the upper part of the blade to right angles.—J. Nolan, Oakley, Calif.

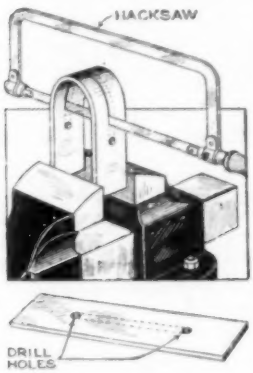
Cutting Square Holes with a Hacksaw

When it is necessary to cut a hole in sheet metal or tubing, as for the installation of a muffler cut-out or exhaust heater, a very clean job can be done with a hack-



With a Little Ingenuity a Hacksaw may be Made to Cut Rectangular and Circular Holes in Sheet Metal and Tubing

saw, if it is used with a little judgment. When a rectangular hole is to be cut in sheet metal, place the piece over a cylindrical piece of wood, and saw two parallel slots where two of the opposite edges of the hole are to be located, holding the saw across the wooden cylinder. Then, without changing the position of the saw, turn the metal so that slots may be cut in the same way along the two remaining edges, and the result will be a clean rectangular hole. When the same kind of a hole is needed in a piece of tubing, make two parallel cuts, and also two diagonal cuts, as shown in the sketch. The adhering pieces are then rolled back and cut off, leaving a clean hole. When an approximately circular hole is needed in a tube, make V-shaped cuts, as shown; but before starting to cut, be careful to locate the points of the "V's" so that the lengthwise and cross diameters will be approximately of the same length.



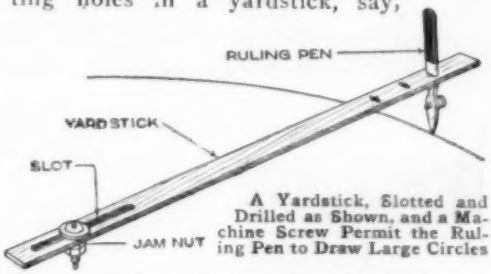
The second illustration shows how this method was applied to a thicker piece of steel. It was one of several in which thin slots were needed, and in this case the locations were first marked with a scriber, and holes drilled at the ends. Each piece was then heated and bent around a piece of pipe into a U-shape, after which it was placed in a vise and slotted in the manner described, the ends of the slot having been already cut by the drill. It was then heated again and straightened, and the edges of the slot were trimmed with a file.

Chips in Slots of Boring Mill

Chips of metal must always be cleared from the slots of a boring mill whenever work is to be done on metal of a different kind. To save a good deal of the time that is lost in this way, place small pieces of wood in all the slots that are not often used, making a fairly tight fit. When one of the plugged slots is needed, it only takes a moment to pull out the small stick, and those which remain plugged are kept clear of metal.—S. G. H., Pittston, Pa.

Compass for Large Circles

A compass for drawing large circles with a ruling pen is readily made by cutting holes in a yardstick, say,

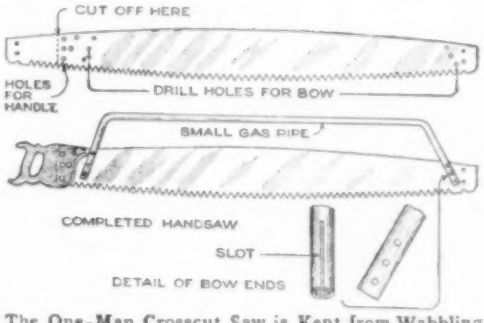


A Yardstick, Slotted and Drilled as Shown, and a Machine Screw Permit the Ruling Pen to Draw Large Circles

3 in. apart, and a long slot at the other end, 3 in. long. In this slot is placed a machine screw provided with a nut and another against it as a jam nut. The end of the machine screw is sharpened to a point forming the center for the compass.

Brace for Crosscut Saw

The principal objection to the use of a long crosscut saw by one man only is that the far end of the saw has a tendency to wabble from side to side, and the middle of the saw tends to buckle on the push stroke. To avoid this trouble, clip off 4 in. from the end of a common crosscut saw, about 5 ft. long, and drill holes through the end for a bow made of iron pipe or tubing, to extend nearly the whole length of the saw, as illustrated. In the end from which the tip was cut off, drill holes for mounting an ordinary one-man handle. While the saw will be made somewhat heavier by the metal bow, the added weight will



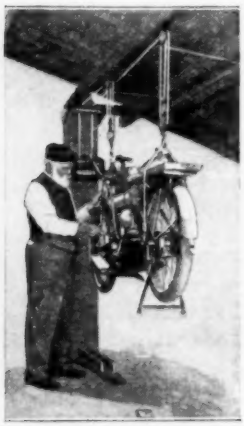
The One-Man Crosscut Saw is Kept from Wabbling and Buckling by Attaching a Metal Bow Which Stiffens It

cause no inconvenience except in carrying the saw, and may even be of assistance in actual use. If the timber to be sawed is quite heavy, the bow will have

to run farther up from the saw, and it should also be made of correspondingly heavier pipe.—S. R. Winters, Washington, D. C.

Windlass Raises Motorcycle in Air for Cleaning

Most motorcyclists who clean and repair their own machines know how irksome the work becomes when it is necessary to sit, or stoop, to get at the motor and other parts. This is made unnecessary by using this homemade tackle device. With it the machine is hoisted to a convenient position and lowered again with very little effort. With the motorcycle about 4 ft. above the ground it is possible to clean it or repair it while standing in an upright position, and without cramping or straining the muscles by bending and stooping. About all that is necessary is a length of heavy window cord, two screw eyes, and two pulleys. The windlass crank was, in this case, made from an old ice-cream freezer handle, and was installed with a few simple fixtures, turned out by an amateur mechanic in his home.



Rat-Poison Box Protects Poultry

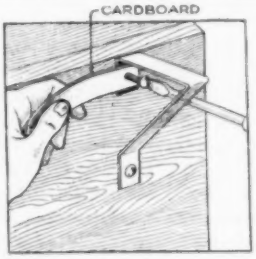
When poison is used to rid a poultry farm of rats, great care must be exercised to prevent the stock from gaining access to it; and a reliable method of doing so is found in the "poison box," of which a practical type is shown in the sketch. It is 18 in. square and 12 in. high, and is provided with a hinged lid, which should be kept locked at all times. The holes which admit the rats are 1½ in. in size, and should on no account be made any larger, as the safety of the chickens depends on their inability to enter the box. Very small chicks must be prevented from getting near it, and this can be managed by keeping them in some kind of inclosure. Sugar of lead is a dependable poison to use, two parts of corn meal being mixed with one part of the poison.—J. T. Bartlett, Boulder, Colo.

Desk Blotter Used as Desk

A traveling salesman found that many of the rooms which he occupied in different hotels were not provided with tables suitable for writing, and he therefore included a movable one with his baggage. It consisted of a large blotter with a rigid back, and a small cast-iron clamp, with which he was able to secure it firmly to the arm of a chair. He generally found an armchair in the hotel rooms he engaged, and the blotter fitted into a large suitcase, taking up hardly any room.—George O. Reed, Detroit, Mich.

Cardboard Holds Screws for Starting

The sketch shows a bracket being screwed to woodwork under difficulties. It is only one of many awkward situations where a screwdriver must be used. Each of these problems calls for ingenuity on the part of the workman, but a number of them can be solved by passing the screw through the end of a strip of cardboard. The cardboard holds the screw in places where the fingers cannot enter, and keeps it steady until it has been fairly started.—Chas. H. Willey, Concord, N. H.



Picking Up Papers and Leaves

For picking up fallen leaves or old papers from a lawn, a stick fitted with a sharp metal wire or nail on the end is commonly used, and the leaves are then removed from the stick and thrust into a basket or other receptacle. It has been found that an improvement on the smooth point is a three-cornered file, which is rough enough so that the leaves do not fall off, once they are pierced, until pulled off by the hand.—Chas. A. Goddard, Los Angeles, Calif.

Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A Ring-and-Tangle Puzzle

By EVERETT A. THOMAS

ANYONE who enjoys perplexing his family and friends can get a good deal of entertainment out of a puzzle made with three rings, about 1¼ in. in diameter, a straight piece of wood, 12 in. in length, and about 6 ft. of heavy string. He must be prepared to do a little close thinking himself before passing the mystification on to others, and he should not expect to understand the puzzle merely by studying the illustrations. He will have no difficulty in making it, as the rings can be obtained from a blacksmith or a hardware dealer. Harness rings will do, and the wood can be cut from a yardstick. The stick must be of a size to slide easily through the rings, allowing about ⅛-in. clearance.

When the materials have been obtained, divide the stick into three equal parts, as shown in Fig. 1, and paint them red, white, and blue respectively, beginning at the left. Bore holes, ¼ in. in size or a little larger, at the points of division, and also bore small holes at the ends, just large enough to admit the string. Paint each of the rings to correspond with one of the three divisions, so that there will be a red, a white, and a blue ring. Then attach the string to the stick as shown in Fig. 2, tying knots at both ends to secure it at the small holes, and fastening it at the large holes with the type of hitch shown in the drawing. Each ring will then hang in a large loop beneath the division painted the corresponding color on the stick.

Everything is now ready. The object is to get all three rings onto any one of the large loops at the same time, or to exchange their positions, so that the red ring hangs beneath the blue division, and vice versa. Lay the puzzle on a table, so as to leave both hands free, and pull down the loop of the hitch; then pass the red ring through the loop, as shown in Fig. 3. To bring the loop to the shape shown in Fig. 4, take hold of both parts of the string, as close to the hole as possible, and pull vigorously, until the small

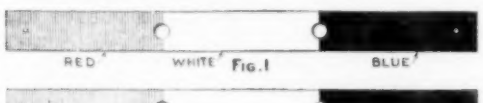


Fig. 1

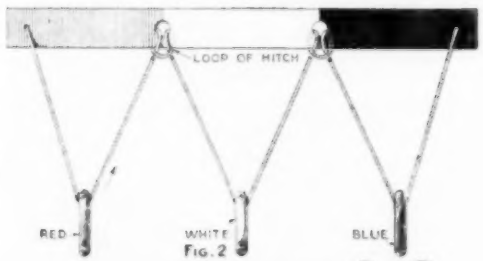


Fig. 2

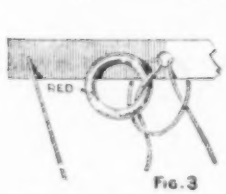


Fig. 3

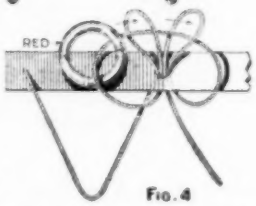


Fig. 4

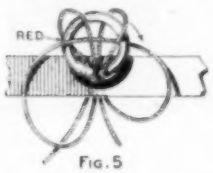


Fig. 5

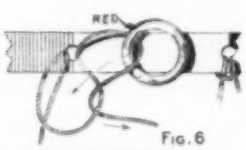


Fig. 6

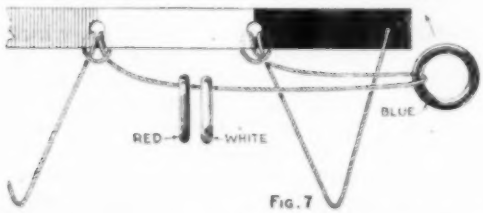


Fig. 7

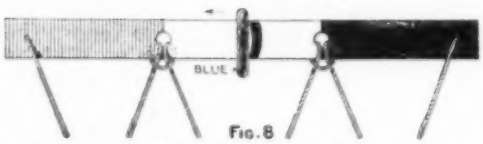


Fig. 8

Three Harness Rings, a Portion of a Yardstick, and a Piece of String Make a Diverting Puzzle with Which the Amateur Magician can Bewilder His Friends. An Apparently Impossible Task Turns Out to Be One of Extreme Simplicity

loop comes right through the hole. It will have a tangled appearance, but if the string has been pulled a sufficient distance, the condition shown in the drawing will be realized. The next step, shown in Fig. 5, is fairly simple, being merely the condition shown in Fig. 4, with the ring passing through the loops on its way to its new position. After it has passed through, take hold of the strings at the back of the stick, as near as possible to the hole, and pull the small loop back through the hole, reversing the process which produced the arrangement of Fig. 4. The result will be as shown in Fig. 6, and nothing more is necessary, except to reverse the process of Fig. 3; or, in other words, to pass the ring through the small loop downward and to the right, so that it will occupy a position beside the white ring on the large loop in the center.

Before going any further, the process just described should be repeated a few times in both directions and with all three rings, so as to develop familiarity with the operation. When this has been done, the next step is to exchange the positions of the rings; for practicing this the blue ring may as well be used.

First, get all three rings onto the central loop by the process just described, and raise the blue ring to the level of the stick on the right, as shown in Fig. 7. Pass it over the end of the stick, as indicated by the arrow, and push it along the stick toward the left. It will gather up the right-hand loop into a tangle as it travels, but will eventually leave it behind when it reaches the center of the stick, and the result will be as shown in Fig. 8. Continue passing it along to the left, until it has gone the entire length of the stick, gathering up the left-hand loop on its journey. When it has reached the end of the stick, let it drop, and it will fall into position beside the red ring on the central loop, from which it can be easily moved into the loop on the left by repeating the operation described at the beginning.

Photographing "Moonlight on the Water"

"Moonlight on the water" scenes cannot be photographed if the "camera never lies" saying is true, since dark landscape

A Landscape, Photographed by Daylight under Special Conditions, can be Made to Resemble a Moonlit Scene, Though Care is Needed in Development

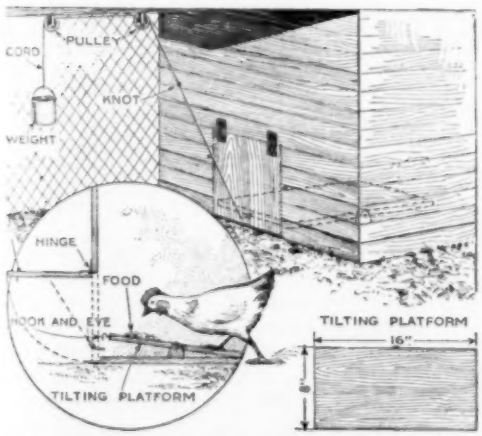
scenes require long time exposures, which are not practical with rippling waves. In the case of good moonlight scenes, the camera does lie, since the "moon," in reality, is the sun. Practically all moonlight scenes are taken in daylight. The conditions under which they can be taken, so as to suggest the night with its more dark tones, are few, and depend on the exposure being so timed as to record the high lights and half tones only. This is almost impossible when a very bright sun is shining. For pictorial effects, as well as for the proper accomplishment of the exposure, clouds must partly hide the sun's disk, or the sun will blur the negative. The hour after sunrise, or that preceding sunset, when but the edges of the horizon are illuminated, is an ideal time for such scenes. The water reflection takes care of itself, although the more placid the ripples and waves, the better the chances for success. One-hundredth of a second speed, at stop 16 (U. S.), is the ideal exposure. On fixed-focus cameras, the smallest stop, at snapshot speed, is successful. In developing, care must be taken that all the lights and shades are fully developed. From 20 to 30 minutes should be allowed for developing, using a very weak solution.

Mitten for Lifting Hot Dishes

For carrying hot dishes, a specially made mitten is much preferred by some to the ordinary square holder, as it gives more perfect security from burns caused by the holder slipping. The back of the mitten should be of drilling or other strong cloth. The face is best made of about three thicknesses of some heavy cloth, the middle one of which may be made ¼ in. scant all around, to avoid too thick an edge for sewing. The pattern for the mitten may be made by laying the hand on a piece of white paper and tracing around its outline, being careful to allow sufficient material beyond this so that the mitten will not be too tight a fit.—C. A. Pease, Monrovia, Calif.

Hens Open Door of Poultry House

The following is one of the simplest methods of enabling hens to open the henhouse door in the morning, thereby relieving their owner of the necessity of rising at daybreak to let them out. The door of the henhouse is hinged at the top, so that it opens outward, and the lower edge catches against the floor, so that it cannot swing inward. Near the lower edge on the outside a cord is attached, which passes upward over two small pulleys hanging from a beam. The other end of the cord supports a tin can weighted with stones, so as to be just heavy enough to pull the door open and keep it so. On the floor of the henhouse, right in front of the door, is a tilting platform, with a hook in the front edge, which fits an eye screwed into the door. The door can therefore be locked at night by catching the hook in the eye, and the pull of the cord against the door on the outside has the effect of making the hook hold securely. When the owner has locked the door in the evening, after the hens have gone to roost, he sprinkles a few grains of feed on the outward end of the tilting platform, which is now in a horizontal position, and leaves the henhouse by the large door, which he locks behind him. On the following morning, the first hen which jumps upon the platform to pick at the feed tilts the platform, releasing the hook from the eye; and the weighted can on the outside pulls the

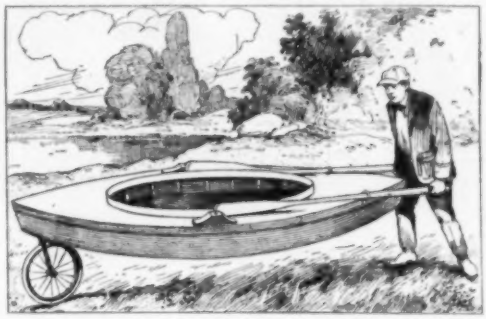


The Hens Unlock the Poultry-House Door at Dawn, by Stepping upon a Tilting Platform

door open. A knot in the cord, made to catch in the pulley, will prevent wrenching at the hinges.—L. Hussakof, Brooklyn, N. Y.

Wheeling a Boat to Water

The sketch shows my way of taking a hunting boat to the river. At the front end of the boat is a tube extending through from top to bottom. Into this



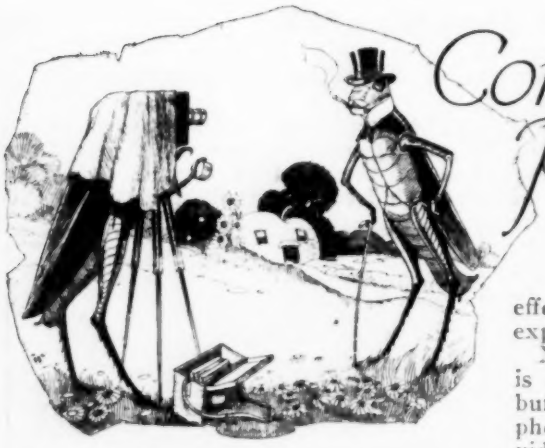
For Moving the Boat to the Water, It is Transformed into a Wheelbarrow with the Oars for Handles

tube I insert the front fork of a bicycle, the top of which is bushed to fit snugly in the tube. At the rear end of the boat I have a hook on either side, as shown. The oars are placed under these hooks, with the blades resting inside of the oar locks.

Thus the boat is transformed into a wheelbarrow, and is easily wheeled to and from the water. Upon arriving at the water, the bicycle wheel with the fork attached is taken out of the tube and put in the boat, and the journey continued by water.—Guy E. Waite, Ottawa, Illinois.

Removing Rag from Rifle Barrel

A cleaning rag wedged in a rifle barrel sometimes presents a problem on a hunting trip, if no gunsmith is within reach. However, if a length of iron rod, or a stove poker, can be obtained, the difficulty can be met. Bring it to a red heat, flatten it a little at one end, and give it two or three twists with a pair of pliers, so as to make it resemble the shank of a drill. Finish it off to a drill point, and sharpen it with a file. Then temper the point slightly in cold water, and bend the other end over, so as to make it easy to turn. It is used in the same way as a corkscrew. Thrust it into the gun barrel, and twist it into the jammed piece of rag until it has taken a firm hold, after which it is pulled out with the rag attached. A heavy wire has been successfully used in the same way to remove obstructions from a .22-caliber barrel.—Herbert J. Key, Spirit River Station, Alberta, Can.



Comic Insect Photography

By Lehman Wendell

ONE of the most amusing of all photographic diversions is the making of comic insect pictures. There is nothing either mysterious or difficult about this branch of photography, and anyone with a little patience and perseverance can produce pictures quite as interesting as mine. One of the essentials, however, is a suitable camera. Any camera that is provided with a good lens and a long bellows extension will serve the purpose. A good lens is essential because the interest of the pictures lies largely in their details, and one cannot produce fine details with a cheap lens. The bellows must be sufficiently long for close-up work, because the pictures are all staged a foot or two from the camera, necessitating an unusually long draw of the bellows.

The pictures are all arranged and photographed indoors. It would be out of the question to take such pictures out in the open, where the gentlest wind would be sufficient to upset the whole scheme of arrangement.

The insects themselves are captured alive, then put to sleep with chloroform. The simplest method of administering the drug is as follows: Moisten a pellet of cotton with the drug and place it in the bottom of a drinking glass. Watch the proceedings carefully, and the moment the insect is fully asleep, which will require about five minutes, take it out, pose it and make the exposure. It is well to have everything else in readiness. Have the picture arranged, and the camera in place and focused before the insect is posed. Then no time will be wasted, and the picture can easily be taken before the insect wakes up. It is well to watch the antennæ of the insect carefully while the exposure is being made. If they move ever so little, it is an indication that the insect is not fully chloroformed, and it should be subjected a little longer to the effects of the drug, after which a second exposure should be made.

Naturally, one of the main difficulties is to get the insects to stand upright; but a little ingenuity on the part of the photographer will soon solve each individual problem. In many cases all that is necessary is to balance the insect against some object, though this must be done cleverly so as not to give the impression that the insect is leaning against something for the sake of support. In other cases, a fine wire prop will be required, and this should always be skillfully hidden behind the insect so that it will not be apparent in the finished picture. I prefer a fine copper wire, as this is soft and pliable, and is easily bent to shape.

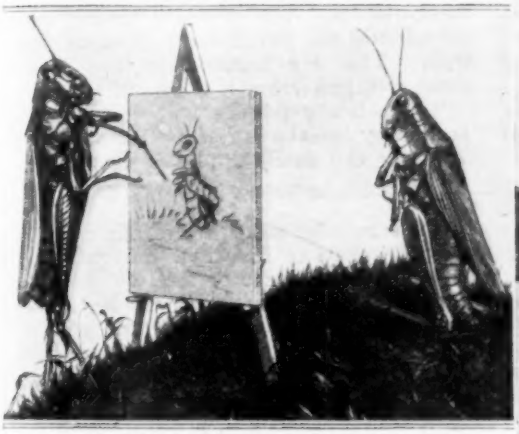
In most of my pictures the foreground consists of some species of moss. This can be found growing in abundance in almost any wooded locality, and it is well to choose a number of different varieties to avoid sameness in one's pictures. Where bushes are needed to break the monotony of the landscape, I use a certain species of lichen, which grows luxuriantly in many parts of the United States. In fact, there are innumerable vegetable forms which can be combined with insects to produce interesting and weird effects.

I almost invariably use a white background, as this seems to set off the insects to best advantage. A sheet of white paper placed several feet from the main setting, will serve the purpose admirably. By placing it at a distance from the main objects it is thrown out of focus, thereby preventing the grain of the paper from showing. For a black background I use a sheet of black paper, or any dark object, such as a black garment, placed far enough away to be out of focus.

Occasionally clouds will be found to enhance the picture greatly. For this I employ a set of 12 by 14-in. enlargements made from cloud negatives, and I use one of these prints much as a photographer uses a background in his studio. It is placed immediately behind the moss,

"A HOPPER BUNGALOW"

A Foreground of Moss and Two "Sunflowers" Lend a Distinct Air of Realism to the Apple Dwelling House of the Two Grasshoppers

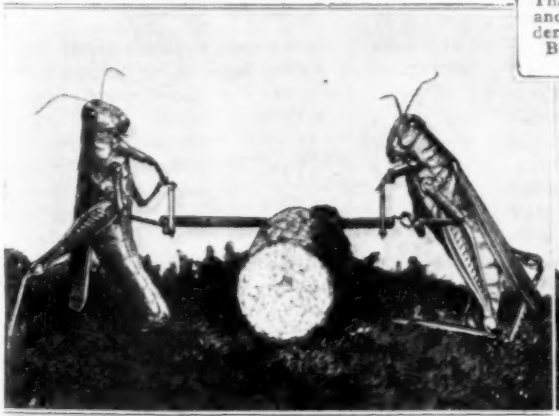


"BEWARE OF VANITY"

It Is Apparent from This Photograph That Considerable Expression can, by Skillful Posing, be Put into the Attitude of the Insects

"THE FISHERMAN"

The Lake Is Nothing More Than a Pan Full of Water, and the Fishpole Is a Slender Stalk of Hay, Carefully Bent to a Curved Shape



"THE LUMBERJACKS"

Besides the Usual Moss Foreground and Bits of Fine Wire, the Materials Used Here Include a Dentist's Saw and Some Bits of Broom Straw

"THE GARDENER"

A Few Twigs Form the Body of the Wheelbarrow; the Wheel Is a Round Disk Cut Out of Stiff Pasteboard

because it must be in sharp focus. Of course, such an enlargement must be made on smooth paper so that the grain will not show in the finished picture.

In doing close-up work with a camera, it will be found that all planes of the picture are not equally sharp on the ground glass. If the portion of the composition nearest the camera is brought into sharp focus, objects 3 or 4 in. farther back will be blurred. This is due to the nature of a photographic lens when it is wide open. To overcome this, focus on the objects in the center of the composition, then use the smallest diaphragm opening of the lens. This will usually give a clear-cut picture throughout. A small opening, of course, means a much longer exposure, but I have found that with a plate or film of the ordinary speed, an exposure of 30 seconds will be found sufficient, providing the picture is staged two or three feet from a window.

In order to make my methods perfectly clear, let me explain briefly how some of my pictures were staged.

The Fisherman: This picture was posed in a small pan of water. The pan was filled almost to overflowing, and this prevented the edge of the pan from showing. The moss rests on a wire support placed in the bottom of the pan. The background is a 12 by 14-in. enlargement from a cloud negative, and the trees are a part of this enlargement. The fishpole is a slender stalk of hay, while the line is a fine embroidery thread.

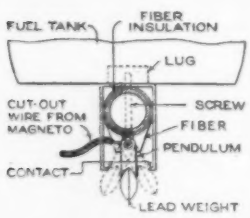
The Lumberjacks: The foreground is a piece of moss, and the log is a section of a small branch. The saw is one used by dentists, and the handles are tiny bits of broom straw, split and tied on with fine copper wire.

A Hopper Bungalow: The foreground is moss, as usual. The house is an apple hollowed out, the window frames being straw, and the porch the half of an acorn cup. The big sunflowers are minute flowers taken from a common weed.

These few examples will serve to illustrate my methods, and the ambitious amateur can easily duplicate them.

Gravity Switch Stops Motorcycle Engine in Case of "Spill"

Even though a motorcyclist may escape injury in the occasional spills that the best of them take, the machine becomes as dangerous as a kicking horse, once it is down, with the motor continuing to run. To guard against possible injury and damage to the machine itself, a motorcycle was equipped with a simple gravity switch, which automatically stops the motor in the event of the machine being overturned.

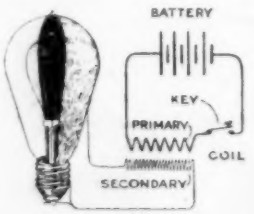


As illustrated by the accompanying sketch, the switch is inconspicuous, and attaches to the machine on the lower horizontal frame bar just in front of the motor. A U-shaped copper piece is fastened astride the frame bar as indicated, being thus "grounded" on the frame of the machine. Fastened to the lower side of the same bar, but insulated from it, hangs a 4-oz. lead pendulum. This pendulum is connected with the cut-out wire from the magneto.

Obviously, when traveling on the road, the little pendulum hangs downward, but the instant the motorcycle falls over, the switch begins to function. The pendulum swings to the right or left, as the direction of the fall happens to be, and its copper stem comes in contact with the points of the copper electrode. This grounds the magneto, and the engine cannot fire until the machine is again restored to its upright position.—John E. Hogg, Los Angeles, Calif.

Induction Coil Produces Sparks in Lamp Globe

Obtain a blown-out incandescent lamp and stretch some bare wire around the globe, or better, cover half of it with tin foil, and connect by means of a wire to one of the high-tension terminals of a spark coil. Connect the other high-tension terminal to both inner and outer contacts of the lamp base, as shown, and wire up a battery to the primary of the coil. A peculiar light will be seen inside the lamp globe, which is of somewhat similar nature to the phenomena occurring in the Geissler tubes used in laboratories.

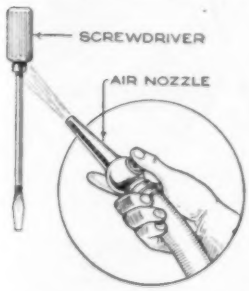


Sewing Machine Made into Jig Saw

A sewing machine, which had become useless in its original function, was equipped with a saw blade and turned into a jig saw, with very little change in its mechanism. Part of the shaft engaging the needle was cut off with a hack-saw a short distance from the base; a short vertical slit was made at the lower end to admit the blade, and a hole was bored through it, so that the blade could be held in position with a small screw. The blade was then run down through the top of the stand and fastened to a stiff coil spring, which was attached to the framework underneath. This served to pull the saw downward in the return half of each stroke, and the machine was used with great success in intricate wood carving. The stroke was so short that only half of the blade was used, but after a time it was reversed, and the other end put into operation.—Dale R. Van Horn, North Loup, Neb.

A Screwdriver-Compressed-Air Trick

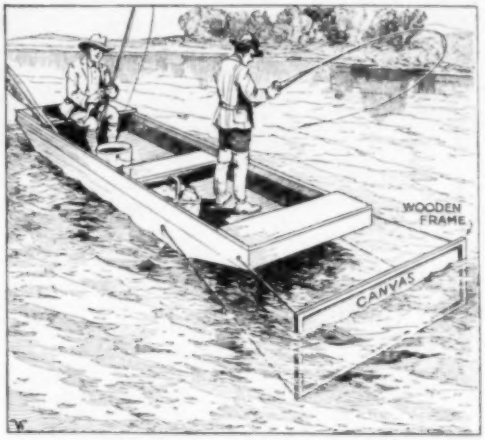
Ordinarily a screwdriver will fall to the floor when dropped from the hand. The same object, when struck by a current of compressed air while falling, will usually be blown to one side, but not always. If the stream of air is directed upward at an angle of 45°, the screwdriver will remain stationary in the air without any visible support. It should be placed so that the lower part of the handle is just in the edge of the air stream, and from 3 to 6 in. from the nozzle, depending on the air pressure and the weight of the screwdriver. This sounds unbelievable, but may be proven by experiment, although the proper relations between air pressure and distance of the tool from the nozzle will probably not be found at the first trial. Since opinions may vary as to the explanation of the phenomenon, none is given here.



¶Lines drawn on tracings with red ink are hard to erase. If the ink is slightly diluted with water it still shows on the blueprint, and is easier erased.

Current Propeller for Boats

The "water mule," or current propeller, by means of which the Mississippi clam fishers move their flat-bottomed boats

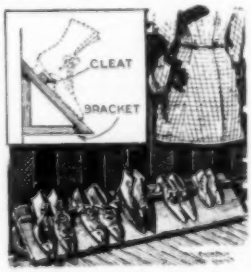


A Boat Equipped with a "Water Mule" Depends on the River Current for Motive Power, and Moves Downstream at a Good Speed

downstream while dragging the bottom with the clam rakes, is an appliance which may be turned to good account in any stream where there is a current. It consists of a wooden frame covered with canvas, as shown in the illustration. By means of four ropes it is fastened at one end of the boat in such a manner that it stands upright in the water. Thus it offers resistance to the current, and when once the boat is under way, the "mule" pulls it along as fast as the water moves.—Earle M. Pettit, Niagara Falls, N. Y.

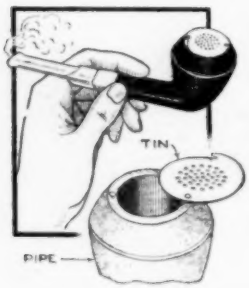
Space-Saving Shoe Rack

A form of shoe rack which takes up scarcely any floor space, and but very little wall space in a closet, consists of a board attached to the wall in a slanting position by brackets, or cleats. A cleat, about ⅜ in. high and 1 in. wide, is nailed the full length of the rack at a distance of 3½ in. from the wall. The shoes rest on the rack in the position shown, and are easy to see, but not likely to be accidentally knocked off the rack.



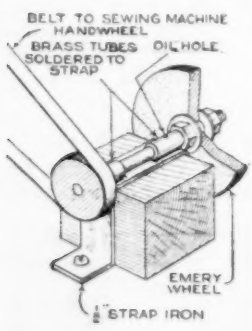
Metal Cover for Tobacco Pipe

When smoking a pipe in a high wind, or in a fast-moving automobile, it is sometimes difficult to keep the pipe alight and to prevent hot ashes from blowing in the smoker's eyes. A pipe with a covered bowl is one of the remedies. The ordinary type of hinged cover is rather difficult to make without the proper tools, but it is generally possible to find a small piece of tin, and to cut a disk of the right size, making perforations with a nail. The disk should have a small lug, as shown in the sketch, which should fit around a short nail driven in the edge of the bowl, and should grip it snugly enough to serve as a lock. Another nail on the opposite side of the bowl serves as a hinge.—Wm. E. King, Monessen, Pa.



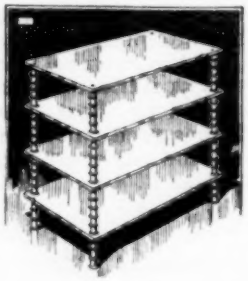
Grinder Fitted to Sewing Machine

A small emery wheel, belted by means of a pulley to a sewing machine, is a convenient addition to the equipment of any household. A wheel 2½ in. in diameter will be large enough for most purposes. Make the shaft 5 in. in length and ¼ in. in diameter, and pass it through two pieces of ¼-in. brass tubing, ½ in. long. These will serve as bearings, and should be soldered to a piece of strap iron, which passes around a wooden block, as shown in the sketch; the block is secured by long screws to the table of the sewing-machine stand. Make the pulley of hard wood, about 1½ in. in diameter, and fasten it to the shaft with a flat-headed screw, which passes through the circumference of the wheel and enters a small cavity drilled in the shaft, thus serving as a set-screw. The screw hole in the wheel is, of course, countersunk. Make the belt of soft leather, about ½ in. wide, and when the wooden block is being screwed to the machine tables, line up the pulley with the handwheel, so that the two may be belted together. In this way, the ratio between the handwheel and pulley will insure high speed. In order to make the belt stay on the pulley, the latter should be slightly crowned.—Harold Jackson, Kankakee, Ill.



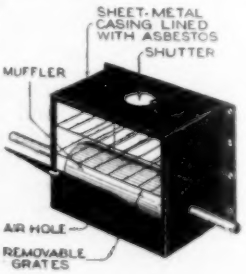
Old Spools Used in Making Shelf Cabinet

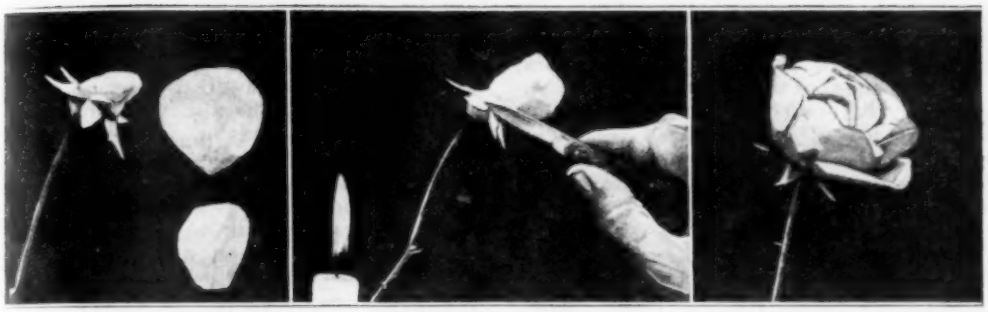
A singularly decorative appearance can be given to a homemade table by stringing wooden spools on pieces of wire, and using them to form the table legs. Wire about 3/16 or ¼ in. in diameter is strong enough, and the shelves, or decks, are made of thin boards, with an equal number of spools at each corner to serve as spacers between each pair of boards. A coat of varnish is applied when the work is complete, and gives the spools an appearance resembling that of bamboo canes.—C. A. Black, Jr., Hightstown, N. J.



A Muffler Stove on a Motorboat

The muffler as a fireless cooker contributes greatly to the convenience and pleasure of a trip by motorboat. The sketch shows the layout adopted by a boatman for a 30-ft. cruiser, the oven in this case being made of sheet iron and asbestos, and completely inclosing the muffler, which stands in the center of the cabin. The door is hinged at the bottom, and two wire gratings support the pans and cooking utensils, while a shutter at the top regulates the temperature, and the draft enters through a hole at the bottom. Potatoes, roasts, corn bread, and all oven-cooked foods are prepared on the gratings, and coffee is boiled by removing the lower grating and setting



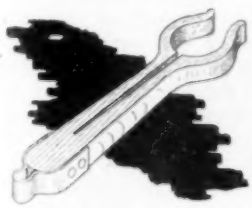


To the Left are Shown the Parts from Which the Rose Is Formed. A Touch from a Heated Knife Blade Fastens the Various Parts of the Flowers Together, Producing a Result Such as Shown at the Right

the pot directly on the muffler. Even in a gale there is nothing to prevent hot meals, as canned foods and soups can be heated in a very few minutes.—G. A. Luers, Washington, D. C.

Holder for Hot-Water Bottle

Those who often have occasion to fill rubber hot-water bottles should use a holder to avoid the risk of being scalded. A pair of jaws at the end support the bottle by the neck, and a slot midway between them receives the projecting seam on the bottle, and gives flexibility. Cut a piece of ash or hickory, 8 in. long, 2 in. wide, and ¾ in. thick, and sketch the outline of the tool upon it with a pencil. Locate a point on the center line, 1½ in. from the end which is to hold the bottle, and bore a hole 1½ in. in diameter. Then cut out the tool with a coping saw, and use a spokeshave and sandpaper to round off the edges. A reinforcing band, or strap, to pass around the end of the handle, is cut out of No. 20 gauge sheet copper (about 1/32 in.), and bent into shape, with a loop at the center to form an eye for the purpose of hanging the holder from a nail. Cut the central slot with a ripsaw, but do not bring it within half an inch from the first of the rivets which secure the strap. Then apply a coat of varnish.—C. S. Bartless, Albany, Georgia.



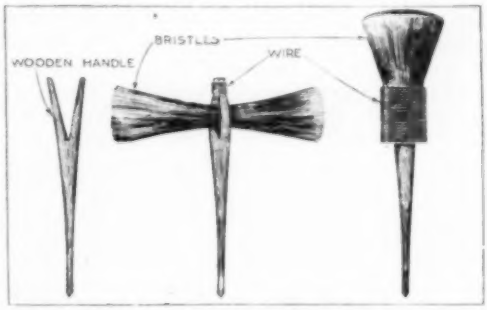
When the handlebar grips of a bicycle break and come off, quite comfortable substitutes can be made by cutting off two pieces of old garden hose, about 6 in. long, and gluing them to the bar.

Candle-Wax Flowers

From a fabric made by immersing a sheet of thin muslin, or some other material, in liquid candle wax, can be made a kind of artificial flowers, which when skilifully formed are difficult to distinguish from real ones. The wax may be colored any shade by boiling aniline dyes with it. The petals of the flowers are cut out of sheets of waxed muslin, and are fastened together by touching the edges with a warmed knife, which melts the wax so as to weld it together. In this way, very beautiful flowers can be built up in a short time, and a very close examination will be required to discern that they are not real.—S. Leonard Bastin, Bournemouth, Eng.

Making Brushes from Hogs' Bristles

Small brushes of the type shown can be made at home, for pleasure or profit, and can be used for many purposes, from painting to shaving—if the bristles are exceptionally soft. Procure two or three pieces of wood, a few handfuls of hogs' bristles, a knife, some sandpaper, and a few feet of copper wire. The stick

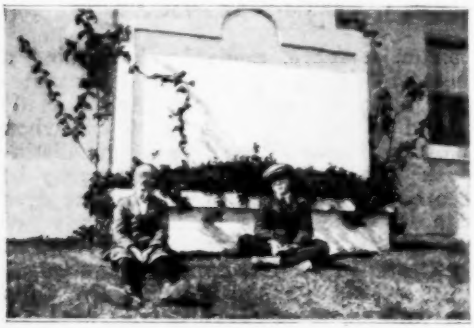


But Little Skill Is Necessary in Making Small Brushes, and a Household can be Stocked Indefinitely at Very Slight Expense by Using the Method Illustrated Here

is first cut to the shape shown, with one end like a fork. The bristles are then placed between the prongs of the fork, and the ends of the prongs bound together. After this, the bristles are bunched together and bound with wire or waxed string, the ends being clipped to make them even.—H. C. Crocker, Edwardsville, Ind.

Flower Box Built on Chimney

The flower box shown in the photograph is used in a California town to contain plants for winter and early-spring



For Early-Season Blooming, Flowers are Given Artificial Warmth by being Planted in a Box Cemented to a Chimney

blooming. It is cemented to a chimney outside a residence, and the masonry retains sufficient heat throughout the night to make the flowers thrive. On days that are cold enough to make a fire necessary indoors, it is, naturally, important to provide additional heat for the plants, and in this way they obtain it. Even in seasons when fires are not needed, the box makes a very decorative flower display.

Cleaning Tracing Cloth with Carbon Tetrachloride

Pencil marks, dirt, grease, candle drippings, paraffin, and like substances may be readily cleaned from drawings on tracing cloth by means of carbon tetrachloride, a colorless liquid resembling water in appearance. It may be applied by means of a soft rag or a clean piece of waste, and rubbed until the marks disappear. It will not injure the cloth, and has the advantage over gasoline, which will answer the same purpose, that it is noninflammable; because of this feature, it may be kept in an office building without objection on the part of the fire inspector.

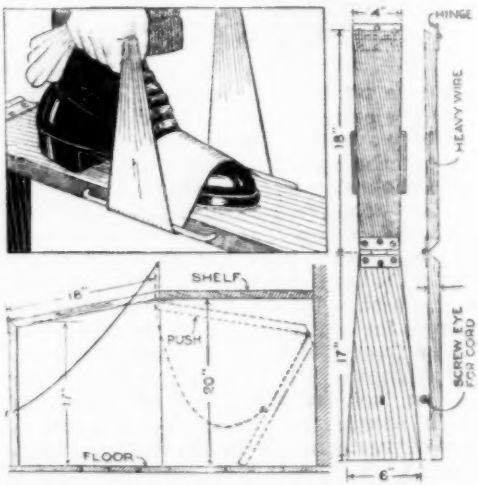
Iron Pipe for Hulling Walnuts

Many black walnuts go to waste each year simply because of the disagreeable task of separating the nut from the green hull which surrounds it. I have found the following method clean and quick: A piece of pipe, about 2 ft. long and 1¼ or 1½ in. in diameter, is all that is necessary. The walnuts should be spread on the ground, or, better still, on a large board. The end of the pipe is pressed over each one in turn, and cuts off the green hull with the exception of a small piece at each end. The walnuts are allowed to dry one day, and the remaining pieces at each end can be readily removed without staining the fingers. As an added precaution, gloves may be worn, though it is hardly necessary.—George E. Perkins, Millburn, N. J.

Support for Polishing Shoes

In households not provided with a regular stand for shoe polishing, it is sometimes difficult to find a suitable place for shining the shoes. Even where a special stand is provided, it may be troublesome from being in the way, and the collapsible stand illustrated may therefore appeal even to those possessing ordinary stands.

The support can be easily made, and attached under a shelf which may be used for any ordinary purpose. When not in



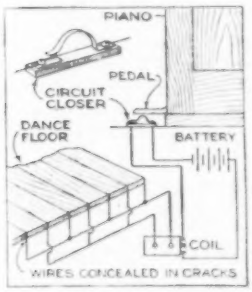
A Shoe-Polishing Stand can be Made to Fold Up underneath a Shelf When Not in Use, and Still Be Ready for Instant Service

use, the shoe-polishing stand remains folded up under the shelf, as shown by the dotted lines. When required for use,

simply grasp the cord, pull the stand out, and set it up in position, as shown. Pieces of heavy wire may be mounted at the sides, if desired, so that the polishing cloth may be passed under them, or rollers may be added to facilitate this method of shoe polishing. When the work is finished, the stand is grasped by the vertical member, which is pushed under the shelf. Pushing upward on the horizontal piece of the stand, in the spot indicated, will bring the other piece tightly into position if the length of the vertical piece is correctly determined.—F. E. Leitch, Brooklyn, N. Y.

Electrified Dance Floor

Quite a sensation, electrically and socially speaking, was created at a party dance by the arrangement shown in the illustration.

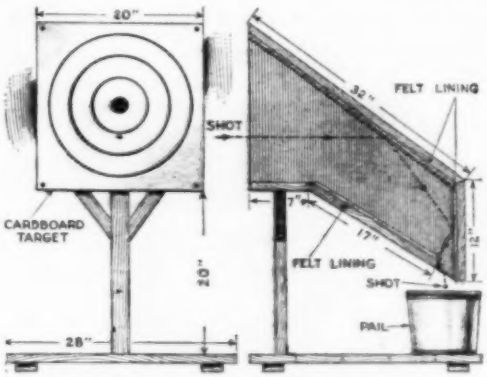


The sustaining pedal of the piano was fitted with a simple circuit-closing device made of two strips of brass fastened to a small board. This was so arranged that when the pedal was depressed, the circuit was closed to the primary of a ½-in. spark coil. The secondary terminals of the coil were connected to fine copper wires laid in the cracks in the floor. The dancers received a tingling spark every time the player pressed the pedal.

The fine wires in the floor cracks can be detected only by the closest observation, and a switch can be arranged to cut off the current when desired.—Thos. W. Benson, Philadelphia, Pa.

Air-Rifle Target Saves Shot

A target of the kind shown in the sketch makes it possible to use the same ammunition repeatedly when practicing with an air rifle, and as the flight of the shot ends at the target, there is nothing to prevent indoor practice. The base, upright, and frame are made of wood, which can be taken from an old trunk, or packing case, and the slanting and vertical shields, which deflect the shot, are covered with strips of felt, or scraps of cloth, taken from an old coat and glued to the wood. Do not use tacks, as the head of a tack will flatten the shots. The face of the target is cut from cardboard, or heavy paper, and, if made about 20 in. square,

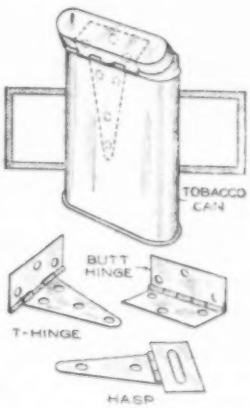


A Slanting Board at the Rear of a Target Insures Both Safety and Economy at Rifle Practice

is large enough for the range of most air rifles.—John P. Robinson, Santa Fe, New Mexico.

Light Hinges from Tobacco Cans

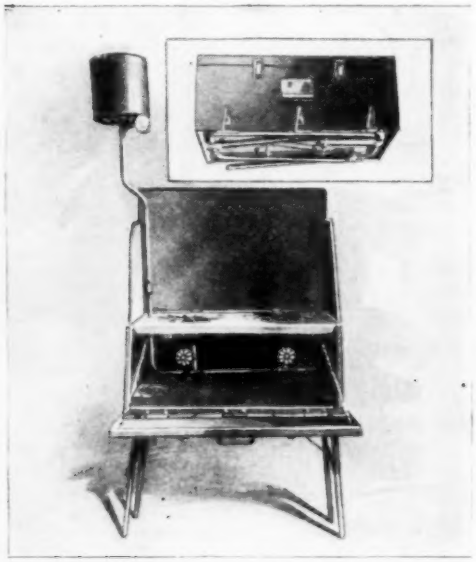
A pair of hinges suitable for holding the lid of a small box, or the door of a fancy cabinet, can be made from two flat tobacco cans. The lid of each of these cans is secured by a pin, which acts as a hinge pin, and runs through tubular lugs on the can and lid. With tinners' shears cut the metal at each end of the pin, and be careful to leave the slight crimp in both can and lid which holds the pin in position. Cut the metal to form the hinges according to whatever design is needed; the sketch gives three varieties. Punch holes wherever necessary, and, if a hasp is being made, cut a slot along the lid of the can.—Harold E. Benson, Boulder, Colo.



¶ It pays to use plenty of varnish, especially on floors. When used on a vertical surface it must be put on in several thin coats; otherwise it will run. On floors it should be put on generously.

A Folding Camp Stove

A camp stove, to be a success, must be light, compact, and easy to set up. It must also have some appliance for shel-



A Gasoline Stove Weighing 28 Pounds Is No Serious Encumbrance in a Camper's Outfit, and Eliminates the Labor of Building a Fire

tering the flame from the wind; and the stove shown in the illustration has all these qualities. It weighs 28 lb., measures 10 by 15 by 24 in., and can be set up or taken down in three minutes. The cover and two sidepieces make a windproof shield, and the hinged lid, which is uppermost when the stove is carried, drops forward when the stove is placed in position for cooking, and forms a shelf. To make it, purchase a small two-burner gasoline stove and wreck it, as these burners can hardly ever be bought separately. Use the top, burners, piping, and tank for the new stove, and make the rest out of light sheet iron. Rivets may be used throughout in putting it together, no soldering being necessary. One view shows the stove ready for cooking, and the other shows it folded for traveling. It will be observed that the sidepieces are hinged, and fall inward over the stove when the latter is being closed.

Bottle Opener Formed from Key Blank

A bottle opener to be carried on the key ring is readily made from a key blank, suitable for the old-style door locks, by filing a hook into the bit of the key.

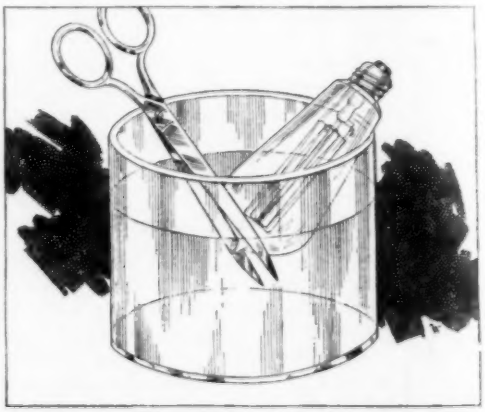
Simple Method of Weighing Air

Finding the weight of air is an experiment which requires some careful work, no matter with what apparatus it is attempted.

Perhaps one of the simplest ways in which the amateur can perform the work is by means of a common burnt-out incandescent lamp, with the aid of a fairly sensitive balance. The use of the bulb makes unnecessary a vacuum pump, as it is already exhausted to a high vacuum.

First, weigh the lamp accurately on the balance; then hold it under water and break off the tip by means of a pair of scissors or some other piece of metal. It will immediately fill with water, leaving only a small bubble, which represents the air which was not exhausted from the bulb. When no more water will flow in, carefully weigh the bulb full of water, being sure to include the tip which was broken off. Now shake the water out, and carefully dry the bulb inside and outside; this is best done by warming it. The bulb is then carefully weighed, thus giving the third result.

To find the weight of the water, subtract the third result from the second; to find the weight of the air which would fill the same volume, subtract the first result from the third. These last are the two results which have to be obtained very accurately, since their difference will be small. Dividing the weight of the air by the weight of the water gives the



An Old Lamp Globe Forms a Very Convenient Vessel for Use in the Experiment of Weighing Air

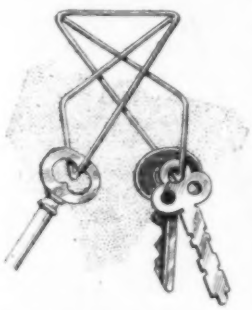
specific gravity of air, which should come out about .0013 if the work is accurate.

An interesting question in connection with this experiment is whether

the first result or the third is the true weight of the bulb. Many persons would say at once that the first result represented the exact weight of the bulb, since it then contained not even air. From this, it would follow that the third result would be the weight of the bulb, plus that of the air it contains. However, since the bulb can be broken to bits, after the third result has been obtained, and the weighing of the pieces will still give exactly the same result, it is clear that the third result and not the first is the true weight of the lamp itself. The first result is, in fact, the weight of the lamp less the weight of the air which it would contain if it had not been exhausted. The case is similar to that of a balloon which is only partly filled with gas—the lightness of its interior buoys it up. The effect on the weight of the lamp is, of course, very small, but it is nevertheless a fact that a vacuum lamp will show, on the balance, a somewhat smaller weight than a gas-filled lamp of exactly the same size.—Victor H. Todd, Rainbow Lake, N. Y.

Paper Clip Used as Key Ring

Large paper clips of the type shown make handy substitutes for key rings, and have an advantage over the ordinary ring in the fact that the two loops make it possible to divide the keys into bunches. In this way, keys which are constantly needed can be kept separate from those which are only used occasionally, and each key is easier to distinguish when it is one of a small group. Office keys can be kept separate from house keys, and all can be quickly found in the dark.—Elmer O. Tetzlaff, Chicago, Illinois.

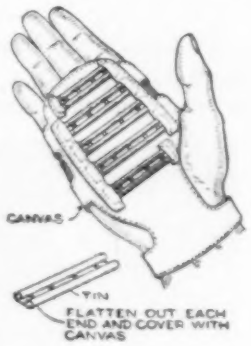


To Keep the Hose Paired

Part of the labor of washing day—or the day after—consists in sorting the articles after the wash. The need of pairing stockings is removed if small snap fasteners are stitched at the tops, so that each pair can be snapped together, going through the wash as one article.

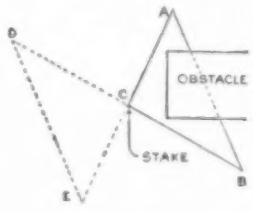
Mittens Take Place of Washboard

For laundering handkerchiefs and other light articles it is not necessary to get out the washboard, large tubs, and other cumbersome paraphernalia which are used for a heavy "wash." A wash-basin or large dish will take the place of the tub, and for the washboard a pair of specially made mittens can be used. These take up no room, and save the knuckles from being worn by rubbing against the board. To make one of the mittens, cut four or five pieces of heavy duck and stitch them together, providing enough material to form bands or straps, which are fastened at the back of the hand and keep the mitten in position. Cut a few strips of tin, about 2½ inches long, roll the edges over as shown, and flatten the ends, so that they can be laid upon the palm of the mitten and held by strips of the material stitched at each end of the metal. Each hand in this way becomes a miniature washboard, and all that is necessary is to place the soiled articles in water, soap them thoroughly, and rub them a few times between the hands. —Riley Edwards, Cedar Rapids, Ia.



To Measure through an Obstacle

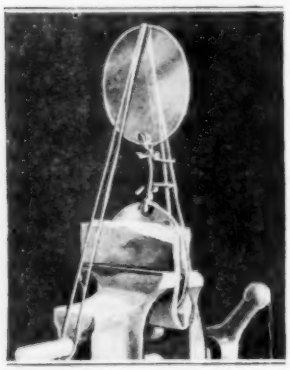
Many methods have been published for measuring the distance from one point to another when an obstacle intervenes which prevents stretching a tapeline. Certainly one of the simplest and easiest of such methods is that illustrated in the sketch herewith, in which A and B represent the objects whose distance apart is to be measured. Drive a stake at any point, C, and fasten a string to it, preferably tied to a nail driven in the stake. Stretch the string tightly to the point A. Holding this point with the finger, walk around to E, and, sighting across C and A to get a straight line, locate point E,



so that CE equals AC. Similarly, locate D so that CB equals DC. Then the distance from E to D is the same as the distance AB, which is sought. The fact is easily proved by the geometrical principles of vertical angles and equal triangles.—F. H. Sweet, Waynesboro, Va.

Cementing Broken Eyeglasses

There are various kinds of glue and cement on the market, with which a piece of glass, such as a lens which has been broken in two, can be mended. It is not so easy, however, to hold the glass tightly in the correct position while the glue is hardening, without danger of breaking the glass anew. The photograph shows one way of doing this.



Several folds of soft paper are used to prevent the breakage of the unbroken lens which is clipped in the vise. The broken piece of the upper lens is placed in position with the proper amount of glue or cement, and rubber bands are employed as illustrated to furnish a steady but not too powerful pressure. The tension of the bands must, of course, be regulated so that the lens is held in just the proper position and not pulled over to one side, but this is easily done by sliding the nearer one of the two rubber bands along the vise.—Herman G. Cuthbert, Newark, N. J.

Wet Paper for Fountain-Pen Wrench

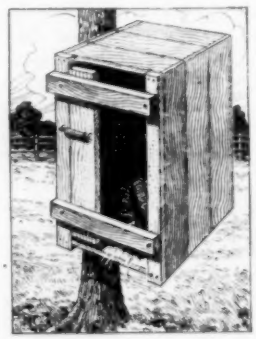
Most people who use fountain pens have at some time found difficulty in unscrewing the part which carries the nib. The hard-rubber surface is so smooth and unyielding that the fingers are unable to obtain a firm grip, so as to loosen the threads when they get stuck together. In such a case, fold a small piece of newspaper once or twice, to form a pad, and moisten it; then place the damp surface against the front part of the pen, take a firm hold, and turn.—K. McLean, Caledon, South Africa.

Handy Tool from Umbrella Rib

A very convenient tool can be made from a piece of an old umbrella rib, and can be used for delicate repair jobs on a piano, and also for lubricating intricate machinery. File one end on the convex side, holding the file at an angle, so as to form a fork, or crotch, at that end of the rib. File the other end on the concave side, still holding the file at an angle, so that a single point will be formed at that end. The tool is then complete, and can be used in a variety of ways. A hammer-butt spring or jack spring, for example, can be replaced on a piano by using the crotch end. In oiling complex machinery, parts that cannot be reached with an oilcan may be lubricated by resting the pointed end of the rib on the bearing, or oil hole, and pouring the oil along the channel formed by the grooved or concave side of the rib. —Jack Solon, Natchez, Miss.

Catching Wild Young Cattle in a Trap

When young cattle run all summer on large pastures in isolated places, they sometimes become quite wild, so that it is difficult to get them into the corrals, or feed lots, in the fall. For one reason or another it may not be desirable to run them down with a horse, or rope them cowboy-fashion, so that more gentle methods become necessary. One of these is the following:



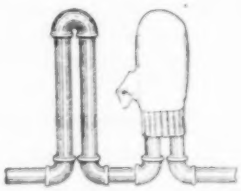
A strong box is made, and firmly fastened to a tree. Some ear corn, or other bait, is placed inside the box. Two 2 by 4-in. pieces are bolted across the front of the box, one near the top and the other near the bottom. A piece, 2 by 6 in., is cut 6 in. shorter than the box and hinged to one front corner post, so it will swing inward. A light spring holds this hinged, upright door against the two crosspieces. Wild range calves will snoop around such a box, and the leader of the bunch will finally put his head inside. In doing so the door will be pushed open until the animal's head passes it, when the spring will pull the door shut and the calf will be held as in a stanchion.

It is well to watch the performance from a distance, because one of the smaller calves might get caught. In that case the larger ones may attack it.

The width between the uprights of the stanchion when closed should be about 7 in. The box should be about 3 ft. high by 2 ft. wide, and the bottom should be set 12 to 18 in. from the ground.—Herbert A. Shearer, Chicago, Ill.

Heat-Coil Mitten Drier

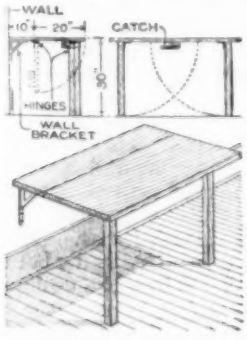
A discomfort familiar to many is that of putting on leather or other heavy mittens or gloves that have become damp on the inside with moisture from the wearer's hands, or from melted snow. Placing them in some warm place will dry them on the outside, but not on the inside, unless they are left for a considerable length of time.



Where a warm-water line is available, a very efficient drier can be easily and cheaply constructed, as indicated in the drawing. A pair of wet gloves or mittens, dropped over these upturned pipes, will dry quickly and thoroughly. If it is ever desired to draw the water from such a line, a drip cock or other outlet should of course be provided at the lowest point in the middle section.

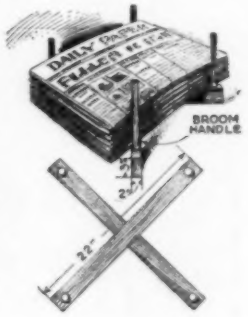
Combination Shelf and Table Takes Little Room

In a place where a table would take up too much room, the combination shelf and table illustrated may be used. A shelf 10 in. wide, is put up 30 in. above the floor with brackets, in the ordinary way. To this is hinged a board, 20 in. wide, having hinged legs that fold up and are held close against the underside of the board with a button catch. This table can be put up in a few minutes, and takes but little room.—Fred Doremus, Garfield, N. J.



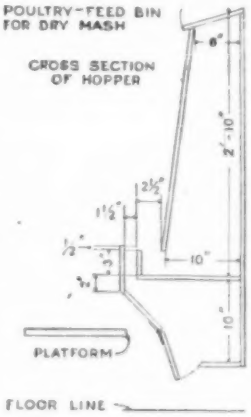
Rack for Collecting Newspapers

Families which make a practice of saving newspapers in order to sell them later, will find it a good plan to use a rack for storage, rather than a drawer or cupboard, as the capacity of the rack is usually greater. A very simple one can be made out of two short pieces of wood and four broom handles, by means of which the papers can be stacked to a height of about 4 ft. The two pieces of wood cross each other at a right angle to form the base, and are sunk, or mortised, into each other at the crossing. Before starting the pile, lay two strings or cords across each other on the base, and when the stack is complete the strings can be tied together at the top, to make a neat bundle.



Poultry-Feed Bin Prevents Waste

With the ordinary poultry-feed bin, there is always more or less waste of grain, because the chickens, while pecking at the grain, are sure to spill some of it over the edge. A bin built like the one illustrated will save nearly all of this wasted grain, as it does not fall onto the ground, but merely into a lower compartment, from which it may be removed, when necessary, by opening the door and replacing it in the upper compartment. The dimensions given are, of course, only suggestive, as the material available for building the bin may largely determine its size.



Kerosene, evaporating from a small jar placed in a clock, produces a lubricating vapor which makes the clock keep better time.

Typewriter Stand and Copy Rack

The old sewing machine shown in the photograph is now giving good service as a typewriter stand. Such tables can

An Old Sewing Machine Supports Both the Typewriter and a Copy Holder, Made from Parts of a Worn-Out Typewriter

be obtained quite cheaply. Since the sewing-machine table was too high for use with the typewriter, the legs were sawed off to the proper length, and smooth gliders were attached to the bottom of the legs, so that the stand would slip easily over carpets. The iron legs were given a coat of bicycle enamel, and the woodwork a coat of shellac, thus completing a nice-looking piece of furniture. The drawers were found quite useful for keeping supplies and stamps.

To the right of the typewriter, on the stand, appears a copy holder, which was made a part of the stand. It is made from a pair of rolls, taken out of a worn-out typewriter. The writing to be copied is held between the rollers, and these can be turned up slightly after each line, to prevent the operator having to search for the place.—M. L. Lowrey, Livermore, California.

Canopy Protects Window from Rain

A house which stood in an exposed situation was rendered almost uninhabitable on one side by rainstorms. The driving rain entered at the upper edges of the window casings, and ran down the inside of the walls to the floor, ruining the carpets. The owner cured the trouble by placing a small metal canopy over each window. He cut a piece of galvanized iron six inches longer than the width of the casing, and three times as wide as the exposed part of one of the clapboards. He then secured it above the window by thrusting one of its long edges between the second and third clapboards above the top of the casing, and hammering half a dozen small nails through it into the wood. It then hung down at an angle of about 30° to the vertical, and completely protected the top of the window. The portion of the iron which entered between the clapboards was bent at an angle to the rest of the material, and another bend was made in the opposite direction at the lower edge, so that the water would flow off easily.—Mrs. Cora Hamilton, Binghamton, N. Y.

Seasoning a New Tobacco Pipe

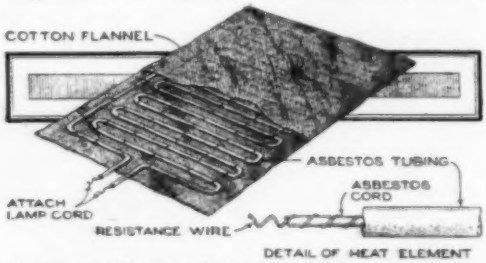
More men would smoke a pipe if they could prevent the rank taste which is so noticeable when a new pipe is being broken in. This can easily be avoided if the following directions are observed. Before the pipe has been smoked at all, fill the bowl with water, and allow it to stand for a few minutes. Then pour out the water, and while the bowl is still moist, load it with tobacco, and smoke. If this is done, a thin cake will start forming from the first pipeful.—J. C. Bailey, Peru, Ind.

An Electric Warming Pad

An efficient electric warming pad, to be used for the same purposes as a hot-water bottle, may be made, as illustrated, from materials which are readily procurable at electrical-supply stores. It is designed for 110-volt current, direct or alternating, and will consume about 50 watts, costing about as much per hour, for current, as an ordinary incandescent lamp.

The heating element consists of 27 ft. of No. 32 nichrome wire. This is first wound like a coil spring around a steel rod; as the rod is removed, asbestos cord is run through the coil to prevent the turns of wire being mashed flat. The cord should be 1/16 in. in size, and about 18 ft. will be required. When the coiling of the wire is completed, it is drawn out to the full length of the cord, and is drawn through a length of asbestos tubing. The tubing should be of 1/8-in. inside diameter, and 7/16-in. outside. The

wire and asbestos cord are drawn through by means of a string, which is first put through with a headless nail, or other slender weight, hung at its end. The tubing is then bent to a shape such as illustrated, and sewed on a piece of cotton flannel, another piece of flannel, sewed on the other side of the tube, completing the pad. The ends may protrude as shown, with flexible lamp cord soldered to the resistance wire, and the joints should be well taped; or, if provision is wanted for renewing the lamp cord when worn, use two blocks of ¼-in. fiber, fastened together with screws, with other screws as binding posts. The current-carrying screw heads and wires should all be set in hollowed-out spaces between the two fiber blocks, so that no conducting metal is exposed, and the blocks are then sewed in at the edge of the pad.—E. Alpha Dean, Chicago, Ill.



An Electric Warming Pad, Using Current from House-Lighting Mains, Takes the Place of the Hot-Water Bottle

A Rustic Summer House

The return of fall—the ideal time for nutting parties and little picnics to a near-by woods—is also the opportune time to gather material for a summer house. During a few hours in the woods, and a few more with a hatchet and saw, the rustic house may be realized. It may be constructed while the pieces of wood are still "green," or, better still, next spring when dried out. During the winter months, they may be sawed into proper lengths in spare time.

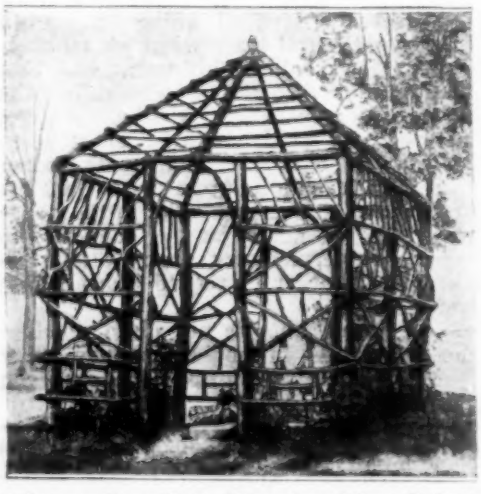
The illustration and material list give an idea of what is required to build a substantial house. Three or four wisterias planted on the sides will make ample covering for years. Honeysuckle, or any other quick-growing vine, may be planted.

The material listed below is sufficient to construct a summer house 10 ft. square. First, square off one end of the upright posts, and set them about 36 in. deep, taking care to have the tops level. Next, the four strips are nailed around the top of the uprights with spikes or wooden pins. The ridges are adjusted, meeting at the center against an octagonal piece, with a globe or other ornament for the tip. The lateral strips forming the roof may then be nailed into place. The horizontal strips are fastened around the ends and sides, as shown in the photograph. The shorter lengths are then placed as shown, the photograph showing the various positions, which may, of course, change according to preference. It is well to flatten all pieces where they are to rest against each other.

If desired, a drinking fountain may be placed in the center of the house, on a concrete slab. Rustic benches on the sides, with a chair or two, will make room for comfortable entertainment of a dozen.

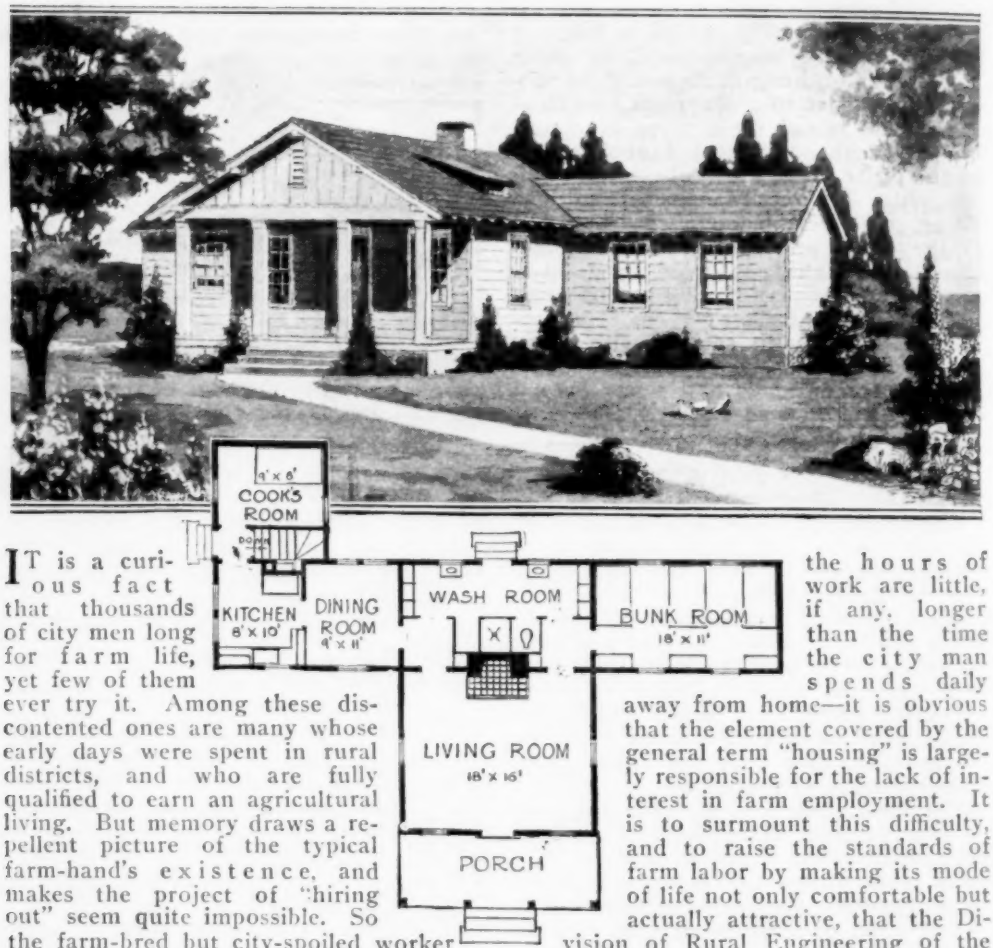
MATERIAL REQUIRED

10 pieces, 4 to 6 in. in diameter, 11 ft. long, used as uprights.
4 pieces, 3 or 4 in. in diameter, 10 ft. long, at base of roof.
8 pieces, 2 or 3 in. in diameter, 7 ft. long, used as rafters to support the roof.
32 pieces, 1 in. in diameter, ranging from 2 to 10 ft. in length, to form the roof. If made longer, the scrap may be used in various places.
8 pieces, 2 or 2½ in. in diameter, 10 ft. long, for sides.
16 pieces, 2 or 2½ in. in diameter, 3½ ft. long, for ends.
60 pieces, 1 in. in diameter, 3 ft. long, used on sides and ends.
20 pieces, 1 in. in diameter, 3½ ft. long, for sides and ends.
2 pieces of wild grapevine, about 2 in. in diameter, for arched doorways.



A Summer House Built of Branches of Trees Is Quite Pleasing to the Eye, as Well as Inexpensive to Make

BUNKHOUSE THAT SOLVES FARM-LABOR PROBLEMS



IT is a curious fact that thousands of city men long for farm life, yet few of them ever try it. Among these discontented ones are many whose early days were spent in rural districts, and who are fully qualified to earn an agricultural living. But memory draws a repellent picture of the typical farm-hand's existence, and makes the project of "hiring out" seem quite impossible. So the farm-bred but city-spoiled worker dismisses the idea of going back until that hypothetical time when he may acquire a few acres of his own. And that time seldom comes. Meanwhile, the farm owner is at his wits' end to get labor of any kind, and to keep it when he has it. For no competent worker will remain long content with quarters in the barn, and even a billet in the house with the farmer's family conveys no sense of permanency, but rather induces the worker to regard himself as a transient.

Since farm labor is not disagreeable—the net funds in pocket compare very favorably with those of city life, and even the hours of work are little, if any, longer than the time the city man spends daily away from home—it is obvious that the element covered by the general term "housing" is largely responsible for the lack of interest in farm employment. It is to surmount this difficulty, and to raise the standards of farm labor by making its mode of life not only comfortable but actually attractive, that the Division of Rural Engineering of the Bureau of Public Roads, Department of Agriculture, has designed a series of farm bunkhouses such as the one illustrated here. This inexpensive dwelling, the division's design No. 1029, normally accommodates three men almost in luxury. With double-deck bunks, six men are made comfortable, and in the stress of harvest time the big living room may temporarily be given over to as many more. Entrance from the fields is through the wash room, where there is a shower and warm water—an important detail.

The government office named above is prepared to supply working drawings of these bunkhouses without charge.

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